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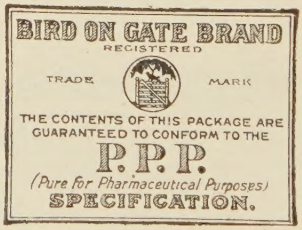

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FROM JULY 1, 1912, TO JUNE 30, 1913,

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

FIFTIETH ANNUAL MEETING

HELD IN

LONDON,

JULY 21–24, 1913.

EDITOR OF THE ABSTRACTS,
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1913.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of the Science and Practice of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.
2. The minimum subscription shall be 7*s.* 6*d.* annually, which shall be due in advance upon January 1.
3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.
4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.
5. The Officers of the Conference shall be a President, a number of Vice-presidents not exceeding six, by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one Local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.
6. At each Conference it shall be determined at what place and time to hold that of the next year.
7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.
8. The Executive Committee shall present a report of proceedings annually.
9. These rules shall not be altered except at an annual meeting of the members.
10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*** *Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf.*, 17, *Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

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BRITISH PHARMACEUTICAL CONFERENCE.

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THE

BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

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YEAR-BOOK OF PHARMACY

CHEMISTRY

ALKALOIDS

Aconite Root, Alkaloidal Value of. (*Evans' Analyt. Notes*, 1912, **7,** 5.) A sample of foreign root, probably containing a little admixed *Aconitum variegatum,* dried at a low temperature and powdered, was assayed by the method previously recorded (*Y.B.*, **1912,** 13), and found to contain in the air-dried condition 0·53 per cent of alkaloid. Weight-titration comparisons, after prolonged vacuum desiccation, showed that 0·06506 Gm. of this alkaloid was equivalent to 1 c.c. N/10 acid (cochineal); this extremely close approach to the theoretical figure 0·06406 for aconitine (Freund), vindicates the value of the extraction method, and also shows that in this case the Et_2O-soluble alkaloid, if not quite pure aconitine and isomers, contains only negligible amounts of other alkaloids of lower molecular weight.

Aconitum Lycoctonum, Alkaloids of. H. Schulze and E. Berling. (*Archiv. Pharm.*, 1913, **251,** 8.) The alcoholic extract of the root, freed from sugar and fat, was made alkaline with Na_2CO_3 and shaken out with Et_2O. This removed *lyaconitine* $C_{36}H_{46}N_2O_{10}$; $[\alpha]_D$ + 42·47°: its aqueous solutions are not fluorescent. The yield is about 2·5 per cent. of the original material. After removing this, the alkaline liquid was shaken out with $CHCl_3$. The residual alkaloids, left on distilling off the solvent, were dissolved in dilute HCl, and the solution treated with KCNS. The precipitate was removed, and the filtrate, make alkaline with KOH, was extracted with $CHCl_3$. This extracted *myoctonine* $(C_{36}H_{46}N_2O_{10})_2$: $[\alpha]_D$ + 44·70°. Both these alkaloids and the one precipitated by KCNS yield *lycoctonine* $C_{25}H_{39}NO_7$ and *lycoctoninic acid* $C_9H_9ON(COOH)_2$ when

saponified with alcoholic NaOH solution. Lycoctonine has the $[\alpha]_D$ + 49·64° ; m.p., 131–133°C. It forms crystalline salts. Lycoctoninic acid forms small yellowish leaflets or needles from dilute EtOH, m.p., 179–180°C. Myoctonine gives a fluorescent substance when heated with dilute HCl. This is *anthranoyl-lycoctonine* $C_{32}H_{44}N_2O$, crystallizing from alcohol in light brown leaflets, m.p., 154–155°C. The alkaloids precipitated by KCNS were not further examined.

Adrenine (Epinephrine) from the Whale. E. R. Weidlein. (*J. Ind. Eng. Chem.*, 1912, **4,** 636.) Adrenine is present in the suprarenal glands of the whale and can be separated from them preserved in $CHCl_3$ after six to nine months. The highest yield obtained was 0·2 per cent. of the moist material, or about 1·2 Gm. from each gland.

If the adrenine, purified by dissolving it in acetic acid, containing a small amount of SO_2 and reprecipitating with AmOH, is injected intravenously, it gives a marked increase in the blood pressure which is not followed by a depressant action. This so-called depressant property of adrenine is due to impurities present in the glands and to decomposition products which are formed by oxidation on standing in aqueous solution. Commercial adrenine shows this after-depression. The commercial product used in making these comparisons was stated to be the best preparation placed on the market. Evidence shows that it increases the blood pressure to the same degree as a much purer product. However, the increase in the blood pressure alone cannot be used as an index of purity but the after-depression must also be taken into consideration. No I could be detected in the glands.

Adrenine (Epinephrine); New colorimetric method for the Determination of. O. Folin, W. B. Cannon, and W. Denis. (*J. Biolog. Chem.*, 1913, **13,** 472; *J.S.C.I.*, 1913, **32,** 159.) Five Gm. of suprarenal glands is extracted with N/10 HCl and water, the mixture being finally heated to boiling. After the addition of sodium acetate solution and further boiling, the mixture is diluted with water and filtered or centrifuged. 5 c.c. of the clear extract is made up to 100 c.c. with water; and the colour produced by 1 c.c. of a special reagent is compared with that given in a like dilution of 1 c.c. of fresh 1 : 1,000 uric acid solution. The reagent is made as follows: 100 Gm.

of sodium tungstate and 80 c.c. of 85 per cent. phosphoric acid are boiled gently with 750 Gm. of water for nearly two hours and made up to a litre. 2 c.c. of the reagent and 20 c.c. of saturated sodium carbonate solution are added to each of the 100 c.c. tests, which are allowed to stand for a few minutes, shaken, and filled up. The colours of the deep blue liquids are compared in a Duboscq colorimeter. The amount of adrenine can be calculated from the fact that it produces three times as much colour as an equal weight of uric acid. (See also *Y.B.*, **1908,** 2.)

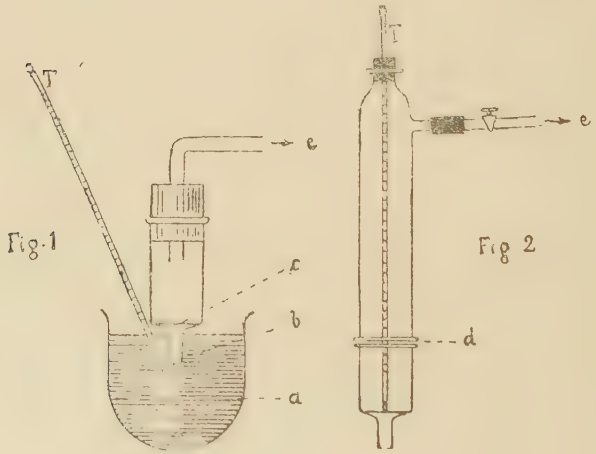
Alkaloidal Valuation of Drugs by means of the Silico-tungsti, Acid Method. H. R. Jensen. (*Pharm. J.*, 1913 [4], **36c** 656.) The theoretical composition of the alkaloidal silico-tungstates is discussed; and the practical application of the acid as a precipitant for organic bases considered. The results of a large amount of experimental work with the alkaloids of colchicum, aconite and ipecacuanha are condensed in tabular form. (See also *Y.B.*, **1909,** 62; **1911,** 35, 38; **1912,** 18.)

Alkaloids and Glucosides, Influence of Temperature on the Formation of, in Plants. J. Burmann. (*Schweiz. Woch. Chem. Pharm.*, 1913, **51,** 117.) In the case of *Colchicum*, *Digitalis ambigua*, *D. purpurea*, *Aconitum napellus*, and *Atropa belladonna*, the amount of active principles formed in different years is found to be in direct ratio to the temperature. A graph is given showing the mean temperatures for each year from 1907 to 1911. The amounts of alkaloids or glucosides found in the above-named medicinal plants determined each year are also plotted out. In all cases these follow the temperature; being lowest in the cold year of 1909 and highest in the warm year of 1911. The mean temperatures for 1912 have not yet been worked out. The thermometric readings from which the data were obtained were taken locally four times in twenty-four hours. (See also *Y.B.*, **1911,** 34; **1912,** 202.)

Alkaloids, Arsenites of. A. C. Mangold. (*Internat. Congress Applied Chem.; Chem. and Drugg.*, 1912, **81,** 617.) As_2O_3 does not combine with alkaloids to form true salts but simply adheres to them With A_2O_5 definite crystalline compounds are formed.

Alkaloids, Microchemical Tests for the Identification of Certain. E. B. Putt. (*J. Ind. Eng., Chem.* 1913, **4,** 509.) A number of fine microphotographs are reproduced showing the characteristic forms of microcrystals of alkaloidal salts obtained by the use of N/10 iodine solution and $PtCl_4$ and $PdCl_2$ reagents. These are very distinctive.

Alkaloids, Microsublimation of, under Reduced Atmospheric Pressure. R. Eder. (*Schweiz. Woch. Chem. Pharm.*, 1913, **51,** 228.) The sublimates obtained under reduced atmospheric pressure are purer, and assume more definite and characteristic



forms than those obtained in the ordinary manner. The temperature at which sublimation occurs is also a useful distinguishing factor. Satisfactory sublimates of many alkaloids may be obtained by means of one or other of the apparatus figured. In Fig. 1, *a* is the H_2SO_4 bath; *b* the substance under examination in a drawn out nipple in a cylinder; *c* the cover-glass on which the sublimate will form. The rest of the apparatus explains itself. Fig. 2 is a self-contained form, the cylinder being longer and divided into two parts at the flange *d*.

Alkaloids, Microsublimation of, as a Method of Identification.

P. Cattani, also — Eder. (*Pharm. Zentralh.*, 1913, **54,** 224.) A small amount of the dry alkaloidal residue is introduced in the small bulb end of a tube, and covered with a micro-cover glass. A partial vacuum is produced in the tube, which is then heated in a H_2SO_4 bath. Most alkaloids thus sublime undecomposed; cocaine between 75–90°C.; atropine between 93–110°C.; quinine between 133–148°C.; and brucine between 158 175°C. These sublimates may then be identified by micro-chemical reactions, by crystalline form, or by crystallographic measurements. It is possible with 0·0005 Gm. of material to obtain quite a number of pure sublimates in this manner, which can be preserved for reference for a long period. A distinct sublimate can be obtained from 0·00001 Gm. of morphine which affords characteristic micro-reactions. (See also *Y.B.*, **1911,** 231; **1912,** 16.)

Alkaloids in Medicinal Drugs, General Method for Determination of. — Daels. (*J. Pharm. d'Anvers*: *Répertoire*, 1912, **24,** 409.) Ten Gm. of the drug, in dry powder, is introduced into a flask with 200 c.c. of $CHCl_3$ and 50 c.c. of 2 : 100 NaOH solution. The flask and its contents are then weighed. The mixture is boiled on the water bath under a reflux condenser for half an hour, with occasional rotation. After cooling, the original weight is made up if necessary by adding more $CHCl_3$, and the liquid is transferred to a separator. The $CHCl_3$ solution is filtered through kieselguhr, 150 c.c. of filtrate being collected. This is shaken out with excess of N/10 H_2SO_4. The acid solution is separated and filtered through kieselguhr, 100 c.c. of filtrate being collected (= 5 Gm. of original drug). The amount of uncombined acid is then titrated in this with N/10 NaOH and haematoxylin indicator. It has been found that under the conditions of the experiment $CHCl_3$ dissolves NaOH equivalent to 0·4 c.c. of N/10 NaOH for every 100 c.c. of $CHCl_3$. Consequently, a correctory factor for the equivalent amount of alkaloids must be used in each case to adjust the final percentage. In the case of *cinchona* each c.c. of N/10 H_2SO_4 used up = 0·0309 Gm. of total alkaloids. From the total percentage found by titration 0·2432 is deducted, the factor representing the equivalent of NaOH dissolved by the $CHCl_3$. With *ipecacuanha*, 15 c.c. of N/10 H_2SO_4 made up to 150 c.c. with water is the acid to be used. The final titration is made with iodeosin from an Et_2O solution instead of from $CHCl_3$. One c.c. of N/10 H_2SO_4

= 0·024 Gm. of alkaloids. The correcting factor is 0·1928 per cent. *Nux vomica* is treated like ipecacuanha, 1 c.c. of N/10 H_2SO_4 = 0·02912 Gm. (?) and the correction 0·2912 per cent. *Hyoscyamus* and *belladonna* are tritrated like ipecacuanha, 1 c.c. of N/10 H_2SO_4 = 0·0289 Gm. of alkaloids; correction, 0·2312 per cent. *Aconite* is also treated like ipecacuanha, 1 c.c. of N/10 H_2SO_4 = 0·0645 Gm. of total alkaloids; correction 0·5160 per cent.

Alkaloids, Solubility of Certain, in CCl_4. C. Baskerville and H. S. Riederer. (*J. Ind. Eng. Chem.*, 1912, **4**, 645.) In the course of an extended investigation on the solvent action of CCl_4 on a number of substances, the following list of solubilities of the commoner alkaloids has been compiled. The figures represent the Gm. dissolved by 100 Gm. of the solvent. Aconitine (amorphous), 1·99 at 18°–22°C.; Brucine, 1·937 at 17°C.; Atropine, 1·136 at 17°C.; Caffeine, 0·089 at 18°C.; Caffeine 0·702 at b.p.; Quinine (hydrated) 0·203 at b.p.; Quinine (anhydrous), 0·529 at b.p.; Quinidine, 0·565 at b.p.; Cinchonine, 0·0361 at b.p.; Cinchonidine, 0·0508 at b.p.; Cocaine, 18·503 at b.p.; Codeine, 1·328 at b.p.; Hydrastine, 0·123 at b.p.; Hyoscyamine, 0·059 at b.p.; Morphine, 0·0156 at 18°–22°C.; 0·032 at 17°C.; Narceine, 0·011 at 17°C.; Papaverine, 0·203 at 17°C.; Strychnine, 0·158 at 20°C.; 0·645 at 17°C.; Theobromine, 0·0212 (at 17°C. ?).

Antipyrine, Detection of, in Toxicological Analysis. G. D. Lauder and H. W. Winter. (*Analyst*, **38**, 97.) Steensma's reagent, a solution of 1 Gm. *p*-dimethylaminobenzaldehyde in 100 c.c. of a solution of 5 c.c. of 25 per cent. HCl in 100 c.c. of absolute EtOH, serves as a good characteristic test for antipyrine. Evaporate the suspected liquid to dryness with 5 c.c. of the reagent and note the characteristic permanent rose-red colour. It is dissipated on warming with H_2SO_4 but reappears on diluting. EtOH and commercial amyl alcohol yield a faint pink colour. $CHCl_3$ is the best immiscible solvent. One Mgm. of antipyrine may thus be clearly detected in 4 oz. of viscera.

Apomorphine, Alleged Formation of, during Heating or Storage of Solutions of Morphine. M. Feinberg. (*Z. Physiol. Chem.*, 1913, **84**, 363; *J.S.C.I.*, 1913, **32**, 549.) Contrary to statements in the literature, there is no formation of apomorphine when solutions of morphine or its hydrochloride are boiled

for a long time, or are kept for long periods. The slight precipitate which sometimes separates in such cases consists of morphine. A new and very sensitive test for the detection of apomorphine in presence of morphine consists in adding 3 drops of a 1 per cent, solution of $K_6Fe_2Cy_{12}$, and shaking with 1 c.c. of C_6H_6. In presence of apomorphine, the benzene becomes coloured amethyst-violet, and on addition of a few drops of dilute NaOH and renewed shaking, the colour changes to violet-red, and on long standing, to a fine violet. The presence of morphine does not interfere with this test, by which apomorphine may be detected in a dilution of 0·003 Mgm. per c.c.

Atropine, Destruction of, by some Animal Tissues. A. J. Clark. (*B.M.J.*, 1912, **2,** 1099.) Emulsified with saline solution and strained, the livers of the frog and rabbit possess the power of destroying atropine; this power persists when all living cells are destroyed, and is due to a soluble body, resembling a ferment in its action. In the frog the liver has a marked power, and the heart and kidneys have a slight power, to destroy atropine; no other tissues have any such power. In the rabbit the liver has a marked power, and the blood a less marked power, to destroy atropine; no other tissues have any such power. None of the tissues investigated in the cat, the rat, and the dog have any power to destroy atropine.

Belladonna, Effect of Cultivation on Alkaloidal Content of. F. H. Carr. (*Internat. Cong. Applied Chem.; Chem. and Drugg.*, 1912, **81,** 432.) The experiments record the results obtained with belladonna grown at Ashford, Kent, on chalky soil, comparisons being made between wild and cultivated plants. Representative portions of the stem and leaf were gathered while the plant was in flower, and rapidly and completely dried at 25° to 35°C. The percentage of alkaloid found in the leaves and stem of the dried wild plant was 0·49; in the leaves and stem of the cultivated plant, during the six years 1906 to 1911, the average percentage was 0·56. Other investigators have usually recorded about 0·45 per cent. in the wild plant. The effect of cultivation has evidently been beneficial.

With a view to testing the effect of modifying the plant-food, ground which had been lightly manured was divided into plots, and these were treated with various fertilisers, added at periodic intervals of three weeks during the growing season,

March to July. The effect of the more common fertilisers is shown by the following table :

Effect of Fertilisers upon A. Belladonna.

Fertiliser.	Time of Application	Per Acre	Percentage of Alkaloid in Dry Stem and Leaf				
			1906 Third Year's Plants.	1907. Fourth Year's Plants.	1910. First Year's Plants.	1911. Second Year's Plants.	1912. Third Year's Plants.
Main crop . .	—	—	0·54	0·34	0·61	0·59	0·68
Farmyard manure	March	50 loads	0·54	0·34	0·61	0·53	0·71
Nitrate . . .	March & April	2 cwt.	0·52	0·23	0·54	0·46	0·64
Calcium cyanamide . . .	Do.	1 cwt.	—	—	0·69	0·49	0·75
Basic slag . .	Do.	2 cwt.	0·61	—	0·65	0·56	0·84
Superphosphate.	Do.	5 cwt.	0·46	—	0·81	0·49	0·76
Potash . . .	Do.	5 cwt.	0·61	0·4	0·75	0·53	0·69

The low figures obtained in 1907 were probably due to the seasonal conditions. Atmospheric conditions have a modifying influence. In the following table the percentage of alkaloid present in the dry stem and leaf of the main crop are set out in conjunction with the weather conditions, the rainfall being official figures for London, sixteen miles distant from the farm :

Year.	Percentage of Alkaloid in Stem and Leaf.	Total Hours Sunshine —May 1 to June 30.	Rainfall (same Period).
		Hours.	Inches.
1905 . . .	0·38	387	5·48
1906 . . .	0·54	361	3·86
1907 . . .	0·34	290	3·54
1909 . . .	0·48	387	5·44
1910 . . .	0·61	360	4·08
1911 . . .	0·59	404	3·62
1912 . . .	0·68	Unusually dry and sunny season	

It will be seen that the highest percentages of alkaloid were observed in the most sunny and driest seasons, while the low percentages found in 1905 and 1907 are explained by the heavy rainfall in the former and the lack of sunshine in the latter season. (See also *Y.B.*, **1912,** 202 ; **1911,** 34.)

As regards the question of the stage of growth at which the

plant may best be collected, results indicate that, while the amount of alkaloid may vary during the season from other causes, there is no marked variation due to different stages of growth from June to September, except when the plant begins to fade, when there is a rapid loss of alkaloid.

Belladonna Root. The commercial drug varies enormously in alkaloidal value. The average alkaloidal content of nine samples of the root grown at Darenth was 0·54 per cent., and this showed practically no variation in any period of the year. It would appear that continental belladonna root, grown in warmer climates, is less rich in alkaloids than British grown root.

Belladonna, Effects of Cultivation and Fertilisers on the Growth of the Plant and its Alkaloidal Content. F. Ransom and H. J. Henderson. (*Internat. Congress Applied Chemistry, New York*, 1913; *Chem. and Drugg.*, 1912, **81**, 443.) The results of experimental cultivation of belladonna at Hitchin, with plants derived from the same bulk of seed are summarized as follows:

Plot	Kind of Manure. Cwts. per Acre.	1910 (Sept.) Yield of Green Plant per Acre.	1911 (June) Yield of Green Plant per Acre.	1911 (Sept.) Yield of Green Plant per Acre.	1910 (Sept.) Total Alkaloid in Dry Leaf.	1911 (June) Total Alkaloid in Dry Leaf.	1911 (Sept.) Total Alkaloid in Dry Leaf.	Rainfall Inches.
		Tons.	Tons.	Tons.	Per cent.	Per cent.	Per cent.	
A	No manure (shade) . .	4	$6\frac{1}{4}$	$2\frac{1}{4}$	0·16	0·255	0·33	1910 April, 2·25
B	Kainit . . 3	$8\frac{3}{4}$	$16\frac{3}{4}$	$6\frac{1}{2}$	0·21	0·285	0·472	May, 2·28
C	Superphosphate 5	$8\frac{1}{4}$	$12\frac{1}{2}$	$7\frac{3}{8}$	0·22	0·265	0·60	June, 1·66
D	Superphosphate 5 Kainit . . 3	$12\frac{1}{4}$	17	$10\frac{1}{2}$	0·18	0·33	0·64	July, 1·72 Aug., 1·81
E	Sod. nitrate. 1 Kainit . . 3	$15\frac{3}{4}$	26	$13\frac{1}{5}$	0·22	0·415	0·737	Sept., 0·99
F	Sod. nitrate. 1 Superphosphate 5 Kainit . . 3	14	$29\frac{1}{4}$	$12\frac{3}{5}$	0·32	0·605	0·72	—
G	Sod. nitrate. 1 Superphosphate 5	$10\frac{1}{5}$	$17\frac{1}{4}$	$12\frac{4}{5}$	0·47	0·46	0·61	1911. April, 1·25 May, 2·49
H	Sod. nitrate. 1	$8\frac{3}{4}$	$18\frac{1}{2}$	$6\frac{3}{4}$	0·36	0·46	0·767	June, 2·09
I	No manure (sun)	$7\frac{1}{2}$	$18\frac{1}{4}$	$8\frac{1}{5}$	0·44	0·65	1·035	July, 0·37
J	Potato mixture 10	$8\frac{3}{4}$	$16\frac{1}{2}$	$9\frac{1}{10}$	0·32	0·792	1·02	Aug., 1·51
	Basic Slag . 7	$17\frac{3}{4}$	$31\frac{1}{4}$	$12\frac{2}{5}$	0·28	0·47	0·747	Sept., 0·94

The formula for potato mixture is: Superphosphate (26

per cent. phosphates), 14 parts; Sulphate of ammonia (20 per cent. nitrogen), $6\frac{1}{2}$ parts; Bone flour ($1\frac{1}{2}$ per cent. ammonia, 60 per cent. total phosphates), (50 per cent. phosphates citric sol.), (38 per cent. lime), $\frac{3}{4}$ parts; Potassium sulphate (48 per cent. potash), 2 parts. The kainit used contained 10 per cent. potash, the nitrate of soda 15 per cent. nitrogen, the basic slag 24 per cent. of phosphate 80 per cent. sol. in citric-acid solution.

Four pounds of leaves were gathered from each plot at the end of September 1910, in the middle of June 1911, and at the end of September 1911, and carefully dried.

The percentage of moisture was estimated for each 4 lb. The percentage of moisture contained in each 44 lb., taken together, was as follows: 1910, 86%; June, 1911, 87%; September, 1911, 85%. The maximum percentage of moisture was in each case found in Plot A; no manure (shade). 1910, 90·6%; June, 1911, 88·7%; September, 1911, 88%. The minimum percentage of moisture was found in Plot H, except in June, 1911, when Plot J contained 1 per cent. less moisture than Plot H, as follows: 1910, H 83·6%; June, 1911, H 85%, J 84%; September, 1911, H 83·4%

The percentages of moisture are of some importance, as they enable the percentage of total alkaloid in the fresh leaf to be approximately calculated, and also because of the effect of shade in reducing the yield of dry material.

The following was the method employed for alkaloidal estimation. It was found to give concordant results, and when the final solution was allowed to evaporate spontaneously a light crystalline residue was obtained in every case. Twenty Gm. of the leaf in 100 powder was exhausted in Dunstan and Short's continuous-extraction apparatus with industrial methylated spirit 66 o.p., eight columns being allowed to pass. The first two columns were percolated cold and reserved to avoid subjecting the bulk of the alkaloid to prolonged heating. After exhaustion, the percolates were bulked, the alcohol recovered, and the soft extract obtained was estimated by the method directed in the "British Pharmaceutical Formulary," 1901, of the B.P.C., for the estimation of total alkaloids in ext. belladonnae folii alcoholicum, using the whole of the extract obtained. The result multiplied by five gave the percentage of total alkaloid obtained from the leaf.

In the table it is not without significance that the highest alkaloidal result was obtained from the plot which had not been

supplied with any manure, but which was fully exposed to the sun (Plot I, September 1911). This appears to be about the highest percentage of alkaloid ever recorded as having been obtained from dried belladonna-leaf. The increased yield of alkaloid in the leaves gathered from the second growth in the autumn of 1911 is of special interest.

Although sufficient evidence has not been obtained that the percentage of alkaloid in the dried leaf is materially altered by artificial manures, it would appear that in several cases the yield of green plant per acre has been largely increased. It would also appear that, in the case of belladonna, it is useless to hope that the drug shall possess anything approaching uniformity in medicinal potency, even when carefully collected and dried.

Belladonna Root, Alkaloidal Value of. (*Evans' Analyt. Notes*, 1913, **7,** 11.) In twelve samples examined, the hyoscyamine ranged from 0·11 to 0·5 per cent.; the average 0·37 per cent. being slightly lower than usual.

Belladonna, Green Extract of. (*Southall's Report*, 1913, **21,** 42.) The green extract produced in 1912 yielded 1·18 per cent. of total alkaloids, a higher figure than has been met with during the last few years, but not far removed from the average. Two samples from other sources have also been assayed, one of British origin yielded 1·03 per cent. of alkaloids; the other, from abroad, but 0·42 per cent. There can be little doubt that the latter had been "reduced" by the addition of an inert extract. (See also *Y.B.*, **1912,** 19.)

Betaines in Plants. K. Yoshimura and C. Trier. (*Zeits. Physiol. Chem.*, 1912, 290; *J. Pharm. Chim.*, 1912, **6,** 319.) Although betaines have been found in the genus *Stachys* they do not occur in *Salvia pratensis* nor in *Glechoma hederacea*. Betaines are found in the flowers of composites. The so-called alkaloid "chryanthemine" found by Marino Lucco in Dalmatian insect flowers is nothing but a mixture of choline and stachydrine. *Mirabilis jalapa* contains trigonelline; *Galeopsis grandiflora* and *Citrus medica* give stachydrine; bitter *Citrus aurantium* contains laevostachydrine. All the plants examined in sufficient quantity gave choline. (See also *Y.B.*, **1911,** 17.)

Calycanthus Glaucus Alkaloids, Further Investigation of H. M. Gordin. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 849.)

When iso-calycanthine was treated with MeI it did not react as expected to form tertiary or quaternary methiodides according to the amounts of MeI used, but about one third of the base present was converted into a new quaternary iodide having the unexpected formula $C_{24}H_{28}N_3IO.\ H_2O$. The reaction probably occurs according to the equation.

$$2C_{11}H_{14}N_2 + 2CH_3I + O_2 = C_{24}H_{28}N_3IO.\ H_2O + NH_4I$$

$$C_{11}H_{14}N_2 + NH_4I = C_{11}H_{14}N_2.HI + NH_3$$

It forms white soft glittering flat needles, turning brown without melting. The hydrated crystals contain 4 mols. of water. The hydroiodide of the quaternary iodide, the chloride and hydrochloride, the nitrate, picrate and picrolonate have been prepared and are described. (See also *Y.B.*, **1910,** 8.)

Carpiline or Pilosine, Further Notes on. E. Léger and F. Roques. (*Comptes rend.*, 1913, **156,** 1687.) When carpiline is heated with water for ten hours in sealed tubes at 140°C., it is split up into two bases and benzaldehyde. One of the bases is very soluble in water, the other is insoluble. The former is identical with Pyman's pilosinine, and the latter with his anhydropilosine. If the experiment be performed with KOH solution instead of water no anhydropilosine and very little benzaldehyde are formed: the product is mainly pilosinine. In the main, the author agrees with Pyman as to the structure of the molecule of carpiline; but he adduces evidence to show that it is a tertiary alcohol with a COH group rather than a secondary alcohol. (See also p. 28.)

Cheiroline, Further Notes on. W. Schneider and W. Lohmann. (*Berichte*, **45,** 2954.) Finely powdered wallflower seeds, freed from fat and dried, were extracted with absolute alcohol, the first, strongly coloured extracts being discarded; on cooling, crude cheiroline-glucoside separated as a hygroscopic brownish yellow powder with 6·7 % alcohol which it loses *in vacuo* over Na on the water bath. It dissolves easily, although not quite clear, in H_2O with faintly acid reaction; the solution acts as an indicator, turning from brownish to a greenish yellow on the addition of a trace of alkali. Strong HNO_3 produces a red colour, disappearing after a time. In the cold, it gives no precipitate with $BaCl_2$, but on boiling with $Ba(OH)_2$, $BaSO_4$ is gradually precipitated. Heated with alkaline Pb solution, it

gives PbS ; with alkalies or acids, H_2S. Cheiroline is not present as such in the solution of the glucoside, for after treatment with $(NH_4)_2SO_4$, Et_2O extracts no mustard oil. After further purification by dissolving in H_2O, filtering, evaporating to dryness and crystallizing from EtOH, the glucoside, still impure, contains S, N and K in approximately the atomic ratio 3 : 2 : 1. When boiled with 5 per cent. HCl until the evolution of H_2S ceases, the filtered solution yields phenylglucosazone, and about $\frac{1}{3}$ of the original S is precipitated by $BaCl_2$ as $BaSO_4$. With $AgNO_3$, the glucoside yields glucose and a light gray, insoluble silver salt, $C_5H_9O_6NS_3Ag_2$. When a meal of black mustard, in which the myrosin has been killed by boiling with H_2O is treated with freshly macerated wallflower seeds, an intense odour of mustard oil soon develops. White mustard and cauliflower seeds act in the same way as those of wallflower. (See also *Y.B.*, **1908,** 43 ; **1911,** 19.)

Cinchona, Determination of Total Alkaloids in. L. Ployart and C. Vallée. (*J. Pharm. Chim.*, 1913, **7,** 118.) 7 Gm. of the powdered, finely sifted bark, dried at 100°C. is treated in a 200 c.c. flask with 140 Gm. of $CHCl_3$ and 10 c.c. of dilute AmOH. The whole is shaken vigorously at frequent intervals during three hours, then 3 Gm. of tragacanth and 20 c.c. of distilled water are added. The whole is well shaken and allowed to stand for an hour. 100 Gm. of the $CHCl_3$ is rapidly filtered through a dry covered filter, the $CHCl_3$ distilled off, and the residue dissolved in 5 c.c. of 95 per cent. EtOH by the aid of gentle heat. The alcoholic solution is transferred to a separator containing 15 c.c. of dilute HCl acid (1 : 250), the containing vessel being washed once with 5 c.c. of EtOH, then twice with 25 ctc.. of Et_2O. After shaking, the acid liquid is run on to a wet filter, and the Et_2O solution washed with 10 c.c. of distilled water. The Et_2O is shaken once more with 15 c.c. of the HCl acid. and washed twice with 10 c.c. of water. The combined acid liquids are warmed to drive off the Et_2O, cooled, and made up to 100 c.c. with the water used for washing. 20 c.c. of the solution is precipitated with silicotungstic acid.

Cinchona Bark, Determination of Quinine in. P. T. Kruysse. (*Pharm. Weekblad,* 1912 [49] ; *Pharm. Zeit.*, 1913, **58,** 128.) Five Gm. of powdered bark is moistened with 3·5 c.c. of water and 1 c.c. of AmOH. Then slaked lime 2·5

Gm. is mixed, and the mixture is extracted in a Soxhlet, with acetone. After distilling off the acetone, the residue is dissolved in 25 c.c. of 1 : 50 HCl; the acid liquid is made alkaline, and shaken out with Et_2O. The Et_2O solution is shaken out with 1 : 50 HCl; the acid liquid made up to 50 c.c. is treated with 0·5 Gm. of $Am_2C_2O_4$ and set aside for the alkaloidal oxalates to crystallize out. These are then collected, washed with a little water, and dissolved in 1 : 50 HCl. The solution is neutralized, treated with $CaCl_2$ and the CaC_2O_4 filtered out. The filtrate is neutralized with AmOH, heated to 100°C. and treated with sodium nitroprusside. The crystalline precipitate thus obtained is collected, washed, dried at 100°C. and weighed. The weight multiplied by 1·03 gives the equivalent of quinine sulphate. (See also *Y.B.*, **1910,** 16.)

Cinchona Bark and its Preparations, Determination of Total Alkaloids in. R. Gaze. (*Apoth. Zeit.*, 1913, **28,** 144.) Five Gm. of finely powdered bark is moistened in a bottle with 5 Gm. of absolute EtOH and 25 Gm. of $CHCl_3$; after thorough mixing 5 Gm. of 15 : 100 solution of NaOH is added; the whole is strongly and thoroughly agitated and set aside for one hour. Thirty Gm. of Et_2O are then added, thoroughly shaken, and as soon as separation occurs, 40 Gm. of the ethereal liquid (=.4 Gm. of bark) is filtered through a small, dry, well covered filter. This filtrate is distilled; the dry residue is taken up by warming with 20 c.c. of 1 : 100 HCl, filtered into a separator through a small filter containing a little absorbent cotton, and the residue washed twice with 5 c.c. of 1 : 100 HCl, these washings being passed through the same filter, followed by washings with water. Ten c.c. of $CHCl_3$ is then added to the acid liquid, and sufficient Na_2CO_3 to render it distinctly alkaline. The liberated alkaloids are then shaken out, and the separated $CHCl_3$ transferred to another separator. The alkaline liquid is further shaken out with 5, 5, and 5 c.c. of $CHCl_3$. The bulked $CHCl_3$ solution is treated with 20 c.c. of N/10 HCl; sufficient Et_2O is added to make the $CHCl_3$ layer float on the top of the aqueous acid liquid. After shaking up for two minutes, separation is allowed to take place. The acid liquid is filtered through a small moistened filter and the $CHCl_3$ is shaken out with 10, 10, and 10 c.c. of water, each for two minutes, and the aqueous liquid is added to that at first separated. The bulked acid liquid is made up to 100 c.c., and of this 50 c.c. (= 2 Gm. of original bark) is

titrated with N/10 KOH and haematoxylin indicator. Each c.c. of N/10 HCl found to be used up is equivalent to 0·0309 Gm. of total alkaloid. *Aqueous extract of cinchona.* Three Gm. of the extract is dissolved in 5 Gm. of water and 5 Gm. of absolute EtOH; 25 Gm. of $CHCl_3$ is added, and the whole shaken after adding 10 Gm. Na_2CO_3 solution. After standing for an hour, 30 Gm. of Et_2O and 1 Gm. of powdered tragacanth are added. The mixture is then well shaken, and after separation 40 Gm. (= 2 Gm. of extract) is filtered off. The above process is then continued. *Alcoholic extract of cinchona.* Two Gm. of this extract is taken and treated as the aqueous extract, the 40 Gm. of final filtrate representing 1·33 Gm. of extract. *Liquid extract of cinchona.* Ten Gm. is evaporated on the water bath to 5 Gm. and treated in a similar manner. For the assay *Tincture of cinchona*, 50 Gm. is weighed, evaporated to 10 Gm., and this residue is treated in a similar manner to the other extracts.

Cocaine and its Substitutes, Distinction of, from one another. D. Scherbatschew. (*Apoth. Zeit.*, 1912, **27**, 441.) Three reagents are employed: AmOH 1 : 10; KOH 1 : 100; saturated solution of $NaHCO_3$. Three separate drops of the solution are put on a glass micro-slide, and to each drop, one drop of each of the reagents is added. The following are the results obtained:

	AmOH solution.	KOH solution.	$NaHCO_3$ solution.
Stovaine .	Precipitate	Precipitate	Precipitate
β-Eucaine .	No ,,	Slight precipitate	No ,,
Nirvanine .	Precipitate	or precipitate soluble in excess of reagent	No ,,
Alypine .	Precipitate	Precipitate	No ,,
Holocaine .	Precipitate	Precipitate	Precipitate
Novocaine .	No ,,	Precipitate	No ,,

Stovaine and holocaine give identical reactions, but holocaine is but little used on account of its toxicity. $KMnO_4$ serves to distinguish cocaine and tropacocaine from the above. These two alkaloids alone give crystalline permanganates. The others all give amorphous precipitates. The precipitate thus obtained with tropacocaine is in well formed typical crystals. That with cocaine consists of small spheres and very fine grains.

Cocaine, Microchemical Reaction for. G. Denigès. (*Bull. Pharm. de Bordeaux*, 1912, **52**, 385; *J. Pharm. Chim.*, 1912, **6**, 509.) When equal volumes of a solution of a cocaine salt and of a 1 : 20 solution of sodium perchlorate are mixed, a precipitate is given which more or less quickly assumes a crystalline form according to the amount of alkaloid present. When there is only 1 : 1,000, the turbidity which is obtained on standing with friction with a glass rod gradually assumes a crystalline structure. A 1 : 100 solution of the alkaloid, in form of a salt, will give an almost immediate precipitate, and in a short time the containing vessel may be inverted without losing its contents. With smaller quantities a longer time is requisite. With a 1 : 1,000 a milky turbidity at first results which assumes a crystalline form on prolonged rubbing with a glass rod. The micro-appearance of these crystals is characteristic. The precipitate consists of very long and fine, interlacing, acicular crystals. By very slow crystallization these show a quadratic formation, and even tablets may be obtained. The reaction serves for the micro-detection of cocaine.

Cocaine, Separation and Identification of small Quantities of. H. C. Fuller. (*U. S. Dept. Agr., Bur. Chem., Bull.*, **150**. 41; *Amer. Chem. Soc. Abstr.*, 1913, **7**, 209.) In the identification of cocaine the m.p. is more reliable than are the colour reactions. The following method of separation has been evolved: Keep solutions at room temperature, dissolve solids in H_2O, N/H_2SO_4 or EtOH with a little NH_4OH. Reduce thick syrups to consistence of 50 per cent. sugar solution. Transfer the solution to a separator, add slight excess of NH_4OH and filter if necessary. Shake out filtrate three times with 50 c.c. Prolius solution. Filter the solvent, evaporate with the aid of a fan over water bath, taking care to remove the dish when the last of the EtOH is driven off. Add 25 c.c. N/H_2SO_4 in 10 c.c. portions, warm gently, filter and wash. Shake out the solution five times with 15 c.c. $CHCl_3$. Wash the separator with 10 c.c. H_2O, discard the $CHCl_3$ and add the wash H_2O to the acid liquid shaken out with the $CHCl_3$. Then add 10 c.c. petroleum ether (40-60°), shake well, separate the acid and discard the solvent. Add slight excess NH_4OH, shake out three times with 15 c.c. petroleum ether, wash the combined solutions once with H_2O, filter off and evaporate the ether rapidly over a H_2O bath with aid of a fan and the cocaine will crystallize, even if only in small quantity. To identify

the alkaloid add 2 c.c. concentrated HNO_3 to the residue in the evaporating dish, evaporate to dryness to remove all HNO_3, cool, add ten to twenty drops of N/10 alcoholic KOH and note odour when cool. Apply gentle heat and note odour again. The odour of ethyl benzoate indicates cocaine. This test, together with the microscopic examination of the gold salt, the physiological test, and the odour of wintergreen developed on digestion with salicylic acid and HCl in a pressure flask, easily distinguishes cocaine from closely related alkaloids. Details of these tests are given.

Codeine, Occurrence of, in Commercial Morphine Sulphate. J. B. Williams. (*Amer. J. Pharm.*, 1912, **84**, 391.) Codeine was found to occur in amounts ranging from 0·9 to 7 per cent. in five samples of commercial morphine sulphate met with in American commerce. Five samples of morphine tablets were also examined. These contained from 2·5 to 6·5 per cent. of codeine sulphate. The method employed to isolate the codeine was as follows: From 0·5 to 1 Gm. of the alkaloidal salt or an equivalent of tablet was dissolved in 15 to 20 c.c. of water. NaOH solution was then added until the precipitate at first formed was redissolved (taking 3–4 c.c. of 5 per cent. NaOH). The alkaline liquid was then shaken out with three or four 20 c.c. portions of $CHCl_3$. The combined $CHCl_3$ extractions were washed in another separator with 10 c.c. of water made slightly alkaline with NaOH. The $CHCl_3$ was filtered through cotton moistened with $CHCl_3$, and the separator washed with two 10 c.c. portions of $CHCl_3$, passing the washings through the filter into the flask. The solvent was evaporated, the residue dissolved in excess of N/10 H_2SO_4, and titrated back with N/50 KOH, using cochineal as indicator. Each c.c. of N/10 H_2SO_4 neutralized by the alkaloid corresponds to 0·0315 Gm. (0·031483 Gm.) of codeine alkaloid or 0·039 Gm. of codeine sulphate U.S.P.

That all of the codeine and practically none of the morphine is extracted by this method was proved in several cases by repeating the extraction of the aqueous residue containing the morphine. The N/50 alkali required in the titration was, in every case, within 0·1 c.c. of the amount required to neutralize the N/10 acid used.

The presence of codeine in commercial morphine sulphate is obviously due to the lack of an official test in the U.S.P. to

detect codeine in morphine salts. A limit of 1 to 1·5 per cent. of codeine is suggested for official recognition.

Datura Stramonium and D. Tatula, Alkaloidal Content of Individual plants of. F. A. Miller and J. W. Meader. (*Amer. J. Pharm.*, 1912, **84,** 446.) The determinations were made upon marked cultivated plants to determine the degree of individual variation and to enable the selection of seed from parent plants of maximum alkaloidal value. In all cases the number of leaves removed was not sufficient to interfere with the growth of the plant. The samples were thoroughly cured at room temperature and stored in paper bags until one year later, when they were assayed. The individual plants assayed as follows :

Datura stramonium L., No. B–979, 0·47 per cent ; No. B–980, 0·55 per cent. ; No. B–981, 0·52 per cent. ; No. B–982, 0·46 per cent. ; *Datura tatula L.*, No. B–983, 0·63 per cent. ; No. B–984, 0·65 per cent. ; No. B–985, 0·47 per cent.

The process of the United States Pharmacopœia for the assay of stramonium was used, and with the exception that N/20 HCl acid was substituted for N/10 H_2SO_4.

Both these species show a higher percentage of alkaloids than any commercial specimens examined during the last five years.

Daturine and Duboisine. H. Beckurts. (*Apoth. Zeit.*, 1912, **27,** 683.) Reviewing the chemistry of the so-called base daturine since it was first isolated by Geiger and Hesse in 1833, and subsequently investigated by von Planta, Ladenburg, G. Meyer, E. Schmidt and others, the author shows that commercial daturine has been found to have no individuality. The so-called "heavy" daturine was a mixture of hyoscyamine and atropine, whereas "light" daturine was hyoscyamine alone. This indefinite nature of chemical knowledge has induced the author to examine Mercks "daturine" of the current commercial quality. This was found to be identical with hyoscyamine. (See also *Y.B.*, **1906,** 30 ; **1909,** 30 ; **1910,** 28 ; **1912,** 23, 193, 251.)

The constitution of commercial "duboisine" is shown to be equally doubtful, as indicated by published investigations. Consequently the author has examined Mercks pure amorphous duboisine, which is found in commerce as a thick oily mass with an odour resembling that of conine. It was found to consist of three bases : hyoscyamine, laevoscopolamine and a third amorphous alkaloid to which the conine like odour of the original

" duboisine " is due. This third base has not yet been identified (See also *Gen. Index.*)

Delphinium Ajacis Seeds, Alkaloids of. O. Keller and O. Voelker. (*Archiv. Pharm.*, 1913, **151**, 207.) Several bases are present in the seeds of *Delphinium ajacis*, only two of which have as yet been crystallized. *Ajacine*, $C_{15}H_{21}NO_4 + H_2O$ forms needles, m.p. 142–143°C., sparingly soluble in water; readily dissolved in MeOH, EtOH, $CHCl_3$, C_6H_6, petroleum ether, and acetone; sparingly soluble in Et_2O and in acetic ether. The solutions are alkaline. In 1 : 10 solutions it gives the general alkaloidal precipitates except with tannin and with $K_2C_{22}O_7$. The colour reactions are not very distinctive. The salts are much more soluble in water than the base, but they show little tendency to crystallize. The sulphate separates from solutions with excess of H_2SO_4 in crystals, probably having the formula $(C_{15}H_{21}NO_4)_4$ H_2SO_4. The hydrochloride thrown out of EtOH solution by pouring into Et_2O is an amorphous white powder, m.p. about 93. *Ajaconine* is much more soluble in water. It occurs in fine well-formed shining prisms, m.p. 162–163°C. With all reserve, the formula $C_{17}H_{29}NO_2$ is provisionally given to it. It does not appear to contain a methoxyl group; but it forms a dibenzoyl and is probably a secondary base. It forms an iodomethylate, crystallizing in needles, m.p., 121° C.

Diacetylmorphine Hydrochloride. (*Evans' Analyt. Notes*, 1912, **17**, 31.) The commercial salt does not appear to be of uniform chemical composition and hydration. The m.p. is not sharp, and is influenced by manipulative conditions. Difference in the amount of the basic and acid constituents and in the solubility have been noted.

Doryphora Sassafras, Alkaloid from. J. M. Petrie. (*Proc. Linn. Soc. N. S. Wales*, **37**, 139–55; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7**, 2092.) A new alkaloid *doryphorine* has been found in the bark of *Doryphora sassafras*, indigenous to E. Australia. It is an amorphous grey powder, m. 115–7°. It has the formula $C_{18}H_{21}NO_4$. The base is toxic, the lethal dose for the frog is 1 Mg. This alkaloid is quite distinct from the bases of related plants.

Erysoline, a Sulphone Mustard Oil from Erysimum Perowskianum. W. Schneider and H. Kaufmann.

(*Liebeg's Annalen*, **392**, 1–15; *Y.B.*, **1911**, 19.) By the same method formerly used for the isolation of cheiroline, the authors have obtained from the seeds of *Erysimum perowskianum* the substance *erysoline* (*δ-thiocarbimidobutyl methyl sulphone*), $McSO_2(CH_2)_4NCS$, in prisms, m.p. 59–60°C, violently irritating to the mucous membrane; it gives PbS when warmed with alkaline PbO is hydrolyzed by acids and alkalies with formation of CO_2 and H_2S; with alcoholic NH_3 it yields a thiourea as a microcrystalline powder, m.p. 143–4°C.; with boiling HCl it gives *δ-aminobutyl-methyl-sulphone hydrochloride*, in leaflets, m.p. 160° C. Erolysine has also been prepared synthetically.

Ethylmorphine and Ethylmorphine Hydrochloride, Test for the Purity of. G. L. Schaefer. (*Amer. S. Pharm.*, 1912, **84**, 389.) Pure ethylmorphine has no distinct melting point. It begins to soften at about 88°C., becoming transparent at about 90°–91°C., and slowly liquefies at 110°–115°C. The solubility of the pure alkaloid is 1 : 480 in water, 1 : 75 in Et_2O, and 1 : 1·5 in EtOH at 25°C.

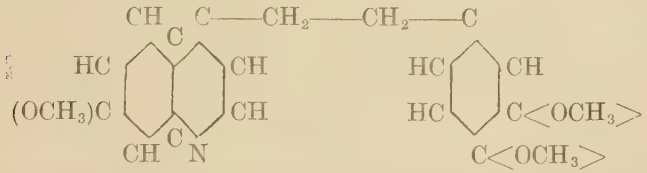
The hydrochloride also has no distinct m.p. It softens at 110°C., gradually becoming translucent at about 120°C., and liquefying at a higher temperature, with decomposition.

Pure ethyl-morphine hydrochloride is soluble: At 15°C, 1 : 11½ in water, 1 : 26 in alcohol; at 25°C., 1 : 8 in water, 1 : 20 in alcohol; at 40° C., 1 : 4 in water, 1 : 8·25 in alcohol; at 50°C., 1: 2½ in water, 1 : 5 in alcohol. Some commercial samples were more soluble than others. These specimens were not pure but contained some amorphous salts of the by-products of ethylation, very soluble in water and Et OH. As there are no tests given to determine the purity of ethyl-morphine hydrochloride the presence of these substances in the salt so far has been unknown.

The presence of these impurities may be detected by the following test: 2 c.c. of a solution of ethylmorphine hydrochloride in water at 25 C., 1 : 40, is treated with three drops of 10 per cent. AmOH. If the salt is pure the solution remains clear and will soon separate out distinct needle-shaped crystals of ethylmorphine. If not pure, and amorphous by-products are present, the solution becomes milky and the separation of crystals may be retarded for hours. From the salts of methyl-morphine this salt can easily be distinguished by making a solution in water 1 : 100, or 0·05 in 5 c.c. of water, and adding 5 drops of

10 per cent. AmOH. If allowed to stand for about two hours ethyl-morphine will be crystallized out, while a solution of methyl-morphine remains clear, without separating crystals.

Galipea Cusparia, Alkaloids of. J. Troeger and W. Kroseburg. (*Archiv. Pharm.*, 1912, **250**, 494.) Angostura bark contains cusparine, galipine and galipidine, besides amorphous oily bases. Galipine is purified from the other alkaloids by means of the greater solubility of its oxalate in water from which it crystallizes out only when fairly concentrated. Cusparine oxalate on the other hand is only sparingly soluble in hot water. The formula



is attributed to galipine from experimental data obtained and detailed. (See also *Y.B.*, **1911**, 27.)

Gelsemium Alkaloids; Further Investigation of Gelseminine. L. E. Sayre (*J. Amer. Pharm. Assoc.*, 1913, **2**, 436.) The amorphous alkaloid "gelseminine" having yielded two bases, one soluble the other insoluble in dilute alkali, a further quantity of the alkaloid was prepared. It was found that the two substances, soluble and insoluble in alkali, gave similar colour reactions and identical physiological reactions. They cannot therefore be considered to be different alkaloids. Further investigation showed that the insolubility in alkali at first recorded was only relative. Gelseminine hydrochloride is partially soluble in Et_2O and in $CHCl_3$. (See also *Y.B.*, **1912**, 28.)

Hydrastis Rootlets and Rhizomes, Relative Alkaloidal Strength of. C. H. La Wall. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 799.) The rhizomes and rootlets out of the same bale of hydrastis were separated and assayed. The rhizomes yielded 2·48 per cent. of hydrastine and the rootlets 1·38 per cent.

Hypophysine, The Active Substances of Hypophysis. H. Fuehner. (*Deut. med. Wochschr.*, **39**, 491; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **17**, 1915.) Hypophysis extracts freed from protein and precipitated by means of ordinary alkaloid precipitants,

the precipitated filtered and decomposed by Ba $(OH)_2$, the excess $Ba(OH)_2$ removed by means of H_2SO_4, the solution concentrated *in vacuo*, yields pale yellow crystals of hypophysine sulphate soluble in weak acid. The crystals are difficultly soluble in EtOH, acetone, and acetic ether. The aqueous solution is optically laevorotatory, and giving the Pauly reaction (red colour with sulphanilic acid). In alkaline solution the crystalline product gives a biuret reaction. The crystals are soluble in acids and alkalies and with NaOH give off amino bases in the cold. Hypophysine differs from adrenaline in its action on the blood pressure and respiration of rabbits in that second injections are inactive. Hypophysine increases the tonus of cat, rabbit and guinea pig uterus; when, however, an optimal tonus is present, it has no action. Virginal and puerperal uteri were also caused to contract by hypophysine. Hypophysine proved also to be only slightly toxic; 1 Mg., sufficient to produce contractions in man, was not toxic to rabbits. Its slight toxicity suffices to differentiate it from histamine which acts similarly upon the blood pressure, respiration and uterus.

Ipecacuanha, Alkaloidal Values of. (*Southall's Report*, 1913, **21.**) During the past twelve months it has proved a matter of difficulty to obtain of this drug parcels assaying 2 per cent. or more of total alkaloids. Fourteen samples in all were examined, yielding by the method of the U.S.P. from 1·54 to 2·22 per cent. of alkaloid, and averaging 1·84 per cent. Ash-yields on two batches of the powder were 3·89 and 2·95 per cent. respectively. (See also *Y.B.*, **1906**, 31; **1908**, 97; **1911**, 33.)

Ipecacuanha, Alkaloidal Value of. (*Evans' Analyt. Notes*, 1912, **7**, 39.) In samples of Minas and Rio varieties the alkaloid content was found to range between: By weight, 1·65 to 2·39 per cent.; by titration, 1·37 to 1·98 per cent. Such roots contained from 7·8 to 12 per cent. moisture. One sample of Johore root was found to contain in the condition received 2·02 per cent. (weight) or 1·81 per cent. (titration) of the above alkaloids. Two samples of Carthagena root contained 1·25 and 1·97 per cent. alkaloids by weight. The alkaloids from the latter sample were more thoroughly examined in view of the conflicting statements as to the relative proportions of the constituents, and it was found that even with vacuum desiccation yielding alkaloids unusually clear and of almost crystalline character, the volumetric strength was unexpectedly low, *i.e.*,

1 c.c. N/10 acid = 0·036 Gm. of such alkaloids. For, assuming the average composition of Rio and Carthagena alkaloids to be as reported by Paul and Cownley: Emetine—72 Rio, per cent; Carthagena, 40·5 per cent; Cephaeline—Rio, 25·9 per cent; Carthagena, 56·8 per cent; their theoretical volumetric equivalents become 0·02426 Gm., and 0·02382 Gm. per 1 c.c. N/10 acid. This deduction shows that on such an average composition Rio root alkaloids should have the lowest basic value, whereas the figure obtained for this very representative Carthagena alkaloid (0·036) is lower than that ever found for even the most impure alkaloid extracted from 40 samples of Rio root. Although this is an isolated figure, since the same extraction solvents (ether-chloroform, ether) were used in all the comparisons, the inference is that such average composition did not represent the rates of emetine to cephaeline in the root, which must have contained a larger amount of emetine, or of some other base of high molecular weight.

Ipecacuanha, Improved Alkaloidal Assay Process for. W.B. Cowie (*Pharm. J.* 1913 (4), **36**, 433, 437.) Ten c.c. of the liquid extract is placed in a flat basin with 5 c.c. of N/1 CH_3COOH and 10 c.c. water; the whole is evaporated to 5 c.c. Twenty c.c. of water is added, with 5 c.c. CH_3COOH, and the resinous matter broken up and removed by filtering through a pledget of cottonwool into a cylinder. The capsule is washed with 10 c.c. water and 1 c.c. CH_3COOH. To the cold mixture is added 1 c.c. Liquor Ferri Dialysatus (B.P. 1885), the whole made up to 50 c.c., well shaken, and set aside to separate. Twenty-five c.c. is filtered off into a separator, mixed with excess of NH_4OH and 20 c.c. of equal volumes of Et_2O and $CHCl_3$, well agitated, warmed, and set aside to settle. This extraction is repeated with another 20 c.c. of the solvent. Two other extractions are made with 10 c.c. of $CHCl_3$, which gives a more complete extraction. The bulk liquids are distilled off and residue dried at 80°C. until weight is constant. The weighed residue is dissolved in N/10 HCl and titrated with N/20 NaOH, using tincture of cochineal as indicator. Factor 0·0244 = 1 c.c. N/10 HCl. A liquid extract of ipecacuanha, yielding by Bird's modification of the B.P. process 1·97 per cent. (weight) total alkaloids, gave by the above method 2·26 and 2·31 per cent. of alkaloids by weight, and 2·08 per cent. by titration.

The method has been applied to the B.P. processes for the bella-

donna, cinchona, and nux vomica extracts; it facilitates the working greatly, and the product in each case is much freer from extractive, so that it it would appear to be of general application, as it yields a relatively pure and uniform product.

Ipecacuanha, Varying Results from Different Official Methods for Alkaloidal Valuation of. E. Reens and P. Van der Wielen. (*Pharm. Weekblad*, 1912, **49**, 986.) Although the pharmacopœias of many countries require ipecacuanha to contain 2 per cent. of total alkaloids this does not ensure uniformity in the potency of the drug. The official processes given for the alkaloidal assay of the drug give widely different results when used on the same parcel of ipecacuanha. The authors obtained results ranging from 1·54 to 2.16 per cent.

Ipecacuanha Alkaloids, Constitution of Emetine and Cephaeline. F. H. Carr and F. L. Pyman. (*Proc. Chem. Soc.*, 1913, **29**, 227.) The authors have obtained results which lead them to conclude that the correct formula for emetine is $C_{29}H_{40}O_4N_2$ rather than $C_{30}H_{44}N_4O_2$ attributed to it by Paul and Cownley. This formula agrees, too, better with the results obtained by those investigators than the formula they have adopted. They agree that cephaeline probably has the formula $C_{28}H_{40}O_4N_2$ as attributed to it by its discoverers, Paul and Cownley. In the stable neutral salts, the bases are combined with two equivalents of acids. Evidence of the existence of basic salts has also been obtained. In each case both the N atoms are present in imido groups. These alkaloids are therefore di secondary bases. Emetine contains four and cephaeline three methoxyl groups, while the latter also contains a phenolic group. Emetine has the $[\alpha]$ - 22° and cephaeline, $[\alpha]_D$ 18°; the salts are dextrorotatory; anhydrous emetine hydrochloride having the $[\alpha]_D$ + 16°. Emetine, when oxidized with Fe_2Cl_6 in aqueous solution gives a scarlet crystalline hydrochloride, *rubremetine hydrochloride*, $C_{29}H_{32}O_4N_2 \cdot HCl \cdot 6H_2O$; m.p. 127–128°C. (corr.). It contains four methoxyl groups and is monobasic. When emetine is oxidized with $KMnO_4$ in aqueous acetone solution, it forms 6:7-dimethoxy-*iso*-quinoline-1-carboxylic acid and hemipinic acid. Cephaeline when oxidized with Fe_2Cl_6 gives two oxidation products: (1) a hydrochloride $C_{21}H_{21}O_7N_2 \cdot HCl \cdot 5H_2O$; m.p. 249–250°C. (corr.) and (2) another hydrochloride $C_{17}H_{21}O_6N \cdot HCl \cdot 4H_2O$, m.p. 158°C. (corr.) with

decomposition. A crystalline *N*-methyl cephaeline derivative has been obtained, m.p. 194°C. (corr.).

Lolium Perenne, Alkaloid Content of Ergot of. G. Bredemann (*Mycol. Centr.*, 1,359; *Chem. Abstr. Amer. Chem. Soc.* 1913, **7**, 807.) Determinations by the Keller-Fromme method on specimens gathered from the same locality by the author showed that ergot from *Lolium perenne* contained several times as much alkaloid as that from rye.

Lycium Chinensis Berries, Betaine in. T. Furuya. (*Pharm. Zeit.*, 1913, **58**, 129.) The berries of *Lycium chinensis*, known in Japan as "Kuko," contain 0·0912 per cent. of betaine.

Maté Leaves, Caffeine in. A. Cappelli. (*Ann. lab Gabelle.*, **86**, 419-24; *J. Chem. Soc.*, **101**, II, 1086.) The author has been able to isolate only caffeine, and has not succeeded in isolating the alkaloid matteine said to occur in the leaves.

Morphine Narcotine Meconate. D. B. Dott. (*Pharm. J.*, 1913, [4], **36**, 99.) It has been stated that when morphine, narcotine, and meconic acid are dissolved together in EtOH equimolecular proportions, and precipitated with Et_2O, that the water soluble product is a double meconate of morphine and narcotine. The author finds that this is not correct. The compound contains slightly more morphine and meconic acid and slightly less narcotine and water than is required by the formula $C_{17}H_{19}NO_3 \cdot C_{22}H_{23}NO_7 \cdot C_7H_4O_7 \cdot 4H_2O$. The small excess of meconic acid renders the compound easily soluble. The difference in the percentages of morphine and narcotine found are not sufficiently far from the theoretical quantity to be of serious therapeutic importance.

Narcotine, Detection of, in Morphine Hydrochloride.— Labat. (*Bull Soc. Pharm. Bordeaux; Répertoire*, 1912, **24**, 446.) Morphine hydrochloride, when heated with pure H_2SO_4 on the boiling water bath, should not develop more than a slight violet tint. If any appreciable amount of narcotine be present, a decided violet colour will result. The test is definite only with 0·4 to 0·5 of narcotine in 100 of morphine hydrochloride; since the latter salt when pure, gives a faint colour. The following reaction is more sensitive. A little of the salt, mixed with 2 c.c. of pure H_2SO_4, and 0·2 c.c. of an alcoholic solution of tannin, or of gallic acid, is heated on the boiling water bath. If much

narcotine be present, a blue shade colour will be obtained; with less, a green tint. The solution, diluted if necessary with more pure H_2SO_4, gives a marked absorption band near the infra-red, when examined spectroscopically. This test will detect 1 : 1,000 of narcotine; that quantity giving a distinct green shade.

Opium and its Preparations, Morphinometric Valuation of. G. Guérin. (*J. Pharm. Chim.*, 1913, **7**, 162.) *Opium.* The opium is dried at 60°C. and powdered. Of this powder 7·5 Gm. is intimately mixed with 3 Gm. of slaked lime. The mixture is then rubbed down with 30 c.c. of water, and the magma is introduced into a 125 c.c. stoppered flask. The mortar is rinsed out with 45 c.c. of distilled water, used in small portions, and the rinsings are added to the rest, in the flask. After well mixing the mixture is left in the stoppered flask for two hours, with frequent gentle agitation. Then 52 c.c. (= 5 Gm. of opium) is filtered off, and transferred to a wide mouth 110 to 120 c.c. Erlenmeyer flask. Then 5 c.c. of acetone is added, followed by 1 Gm. of AmCl. The whole is set aside to crystallize for 24 hours, covering the mouth of the flask with a watch glass. The mother liquor is then passed through two counterpoised filters; to which the crystals are subsequently transferred, and there washed with morphinated water until the washings are colourless and give no reaction for Cl with $AgNO_3$. Finally, four successive washings each with 15 c.c. of pure anhydrous acetone, saturated with morphine, are made. The pure morphine thus obtained is dried at 100°C. and weighed.

Extract of Opium. Three Gm. of extract, dissolved in 75 c.c. of water is treated with 3 Gm. of $Ca(OH)_2$. After two hours contact, 65 Gm. of filtrate is collected (= 2·5 Gm. of extract) and treated as above.

Tincture of Opium. Seventy-five c.c. of tincture is evaporated to dryness and then dissolved in 75 c.c. of water. To this 3 Gm. of $Ca(OH)_2$ is added and the process conducted as above, 52 c.c. being collected (= 50 Gm. of tincture).

(See also *Y.B.*, **1904**, 118, 119, 121; **1905**, 120, 121; **1906**, 50, 55; **1907**, 116; **1908**, 150; **1912**, 30, 31; and *Gen. Index.*)

Opium, Effect of Age on Morphine in. — Debourdeaux. (*J. Pharm. Chim.*, 1912, **6**, 491.) In powdered opium the amount of morphine compounds insoluble in water increases with the age of the sample. The rate of increase is not definite, being greater in a given time in some samples than in others. It

appears to be due to a chemical change. Simultaneously the amount of total morphine decreases. This deterioration is also greater in some instances than in others and is probably due to the presence of an oxydase, and is favoured by contact with air.

Opium, Morphinometric, Valuation of. Milk Sugar as a Disturbing Factor in. C. H. LaWall. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 411.) The presence of milk sugar in standardized powdered opium may lead to erroneous results in the gravimetric determination by the U.S.P. method, particularly in the case of opium rich in morphine which requires the addition of a large amount of the diluent. A sample of opium assaying 21 per cent. of morphine, when diluted with an equal weight of milk sugar, and checked by reassay by the U.S.P. method, gave gravimetric results equivalent to nearly 40 per cent. of morphine. On titrating, however, the correct figure was obtained. The error is due to the lactose separating with the morphine. The results are irregular, more lactose separating sometimes than at others, probably due to variation in the temperature of the mother liquor.

Pareira Alkaloids. F. Faltis. (*Monats. Chem.*, 1912, **33,** 873; *Chem. Zentralb*, 1912, **2,** 1660.) The author finds that both commercial beberine sulphate, and the total alkaloids obtained by extracting the root of *Chondrodendron tomentosum* with dilute H_2SO_4 is a mixture of bases. He has separated three alkaloids, *β-beberine*, "*alkaloid B*" and *iso-beberine*. β-Beberine has the formula $C_{19}H_{16}O_2(NCH_3)\cdot(OH)\cdot OCH_3$, m.p. very indefinite between 142–150°C. The base is amorphous, insoluble in water, and gives amorphous salts. "Alkaloid B" has the formula $C_{20}H_{15}O_2(NCH_3)(OH)_2(OCH_3)$; it is pale yellow and consists of microcrystalline aggregates; melts indefinitely on rapid heating, at 220°C. Iso-beberine, $C_{19}H_{15}O(NCH_3)(OH)_2(OCH_3)$ forms rhombic needles from pyridine and CH_3O, melting at 290°C. with decomposition. Substitution and decomposition products of these bases are described.

Pareira Root, Alkaloids of. M. Scholtz. (*Archiv der Pharm.*, 1912, **250,** 684.) The so-called β-beberine of Faltis is probably identical with beberine; and it can be readily obtained crystalline from MeOH. The formula of the author for this $C_{18}H_{21}NO_3$ agrees better with his results, and those of Faltis

than $C_{21}H_{23}NO_4$, suggested by the latter. The author adheres to his original statements that beberine and iso-beberine have this empirical formula. (See also *Y.B.*, **1907,** 120; **1912,** 32.)

Physostigmine, Researches on the Constitution of: Synthesis of 3-Dimethylamino-acetyl-2-methylindole and of 2-α-Dimethylamino-γ-hydroxypropylindole. A. H. Salway. (*Transact. Chem. Soc.*, 1913, **103,** 352.) The steps in the synthesis of these two bases are described. The latter is isomeric with eseroline, the principal degradation product of eserine (physostigmine). The properties of these two compounds are, however, very dissimilar, as a comparison shows: thus, eseroline in the presence of alkalies readily absorbs oxygen with the production of intensely coloured solutions, whilst the synthetic base is quite stable under similar conditions. Moreover, eseroline readily reduces gold and silver salts, and is also a strong base, which yields neutral salts. The synthetic base, on the other hand, possesses no reducing properties, and is a weak base, yielding salts with a strongly acid reaction. The synthetic base, furthermore, differs considerably from eseroline in physiological action. Eseroline was found to produce the characteristic myotic action of physostigmine (but in a diminished degree) when injected into the eye, and also to effect a slowing of the heart-beat after intravenous injection. The synthetic base, 2-α-dimethylamino-γ-hydroxypropylindole, on the other hand, possessed none of these physiological properties.

Pilocarpus Microphyllus, New Alkaloid, Carpiline from. E. Léger and F. Roques. (*Comptes rend.*, 1912, **155,** 1088.) From the mother liquors of the crystallization of pilocarpine nitrate and hydrochloride, the authors have isolated a new base, giving more soluble salts. This has been named *carpiline*. It has the formula $C_{16}H_{18}N_2O_2$, crystallizing from EtOH in prisms; m.p. 184–185°C.; $\alpha_{20°C.}$ +24° in absolute EtOH. The salts are not decomposed by $KMnO_4$. Carpiline possesses lactonic functions and forms a stable K compound $KC_{16}H_{19}N_2O_4$. Carpiline is a mono-acid base. Its physiological action is very markedly less intense than that of pilocarpine.

Pilocarpus Microphyllus; Pilosine, a New Alkaloid from. F. L. Pyman. (*Proc. Chem. Soc.*, 1912, **29,** 267.) From the mother liquors remaining after separating pilocarpine and iso-pilocarpine from the total alkaloids of *P. microphyllus* leaves,

a new mono-acid base, *pilosine*, $C_{16}H_{18}O_3N_2$, was isolated in a yield amounting to 0·007 per cent. of the leaves. M.p. 187°C. (corr.), $[\alpha]_D = +39·9°$. It contains an N-methyl, but no methoxy-group, and a lactonic grouping. On treatment with acetic anhydride it yields a new unsaturated base, *anhydropilosine*, $C_{16}H_{16}O_2N_2$, m.p. 133°—134°C. (corr.), $[\alpha]_D = +66·2°$. Pilosine is decomposed on distillation with 20 per cent. aqueous KOH, benzaldehyde and a new base, *pilosinine*, $C_9H_{12}O_2N_2$, being formed. The chemical and physiological properties, as well as the solubilities of the latter base, are very similar to those of pilocarpine and isopilocarpine, and it seems probable that this base is a lower homologue of these alkaloids. The physiological action of the three alkaloids is similar to, but very much weaker than that of pilocarpine.

Pilocarpus Racemosus, Alkaloids of. H. A. D. Jowett and F. L. Pyman. (*Proc. Chem. Soc.*, 1912, **28**, 268.) The statements in the literature with regard to the amount and nature of the alkaloid contained in the leaves of *Pilocarpus racemosus* are conflicting. E. M. Holmes (*Pharm. J.*, 1903, [4], **17**, 713) quotes G. Rocher (*Y.B.*, **1900**, 123) who found them to contain 1 per cent. of total alkaloids, of which two-thirds was pilocarpine, but mentioned that another sample examined in the laboratories of Wright, Layman, and Umney, contained only 0·34 per cent. of total alkaloids (*Y.B.*, **1904**, 233). Later, Holmes stated (*P.J.*[4], **18**, 54; *Y.B.*, **1905**, 225), on the authority of A. J. Cownley, that the leaves of *P. racemosus* contained 0·6 per cent. of total alkaloids, which gave about 50 per cent. of a crystalline nitrate melting at 155°C. Since pilocarpine nitrate melts at 178°C. and isopilocarpine nitrate at 159°C., he considered that this nitrate probably consisted largely of isopilocarpine nitrate, or possibly of some other alkaloid. Some time ago the authors examined a quantity of leaves of *P. racemosus* at the request of the Director of the Royal Gardens at Kew; on extracting the alkaloids and purifying them in the usual way, they obtained pure pilocarpine nitrate melting at 178°C. (corr.) in a yield amounting to 0·12 per cent. of the leaves, but no other crystalline products. This result confirms Rocher's statement that the leaves contain pilocarpine. The mother liquors after the removal of pilocarpine gave a red coloration with sodium diazobenzene-*p*-sulphonate, indicating the presence of a base containing a free imino-group, and contained a small amount of bases sparingly

soluble in water. The latter did not yield pilosine when seeded with this alkaloid, and the quantity was insufficient to admit of further purification. (See also *Y.B.*, **1905,** 199; **1906,** 102; **1907,** 12; **1910,** 25.)

Quinine, Testing and Determination of, by means of Sodium Nitroprusside. J. P. Kruysse. (*Pharm. Weekblad,* 1912, [49]; *Apoth. Zeit.*, 1913, **28,** 17.) Sodium nitroprusside may be employed as a microchemical reagent for the detection of quinine; for proving the purity of its commercial salts; and for its determination in the total alkaloids extracted from the bark. Quinine nitroprusside crystallizes from neutral solutions in salmon-coloured needles. Its solubility in water at normal temperatures is about 39 : 100,000; much less than that of the oxalate or tartrate. On adding solution of sodium nitroprusside to a suspension of quinine tartrate in water, the large columnar crystals of the former are soon converted into the acicular form of the latter salt. The same occurs with quinine oxalate. The freedom of quinine sulphate from cinchonidine may be proved as follows: One Gm. of the salt, dissolved in 50 c.c. of boiling water, is treated with 1 Gm. of sodium nitroprusside. After cooling, the liquid is filtered: the filtrate is treated with a few drops of ammonia, warmed to 40–50°C. and set aside. If the quinine is pure the liquid remains clear. In presence of 1 per cent. of cinchonidine a distinct turbidity is evident.

For determining the amount of quinine in bark the following method is recommended: Five Gm. of bark is moistened with 3·5 c.c. of water and 1 c.c. of AmOH. After thorough mixing 2·5 Gm. of slaked lime is added. The mixture is then extracted for two hours in a Soxhlet with 100 c.c. of acetone. After distilling off the solvent, the residue is dried on the water bath. It is then warmed with 25 c.c. of 1 : 50 HCl, filtered, and the filter washed with a little dilute HCl. The filtrate is then transferred to a separator, made alkaline (with AmOH), and the total alkaloids are shaken out with Et_2O, two portions each of 200 c.c. or with $CHCl_3$ in the usual manner. The alkaloids are then removed from the solvent by again shaking out with successive washings of 1 : 50 HCl. The acid solution is neutralized and made up to 50 c.c. The neutral solution is warmed to 90° C., treated with 0·5 Gm. of $Am_2C_2O_4$, and set aside. The precipitated oxalates are collected on a filter, washed with a little water; the filter is placed over another beaker, and the crystals dissolved

and washed off it by dropping on 5 c.c. of 1 : 50 HCl. After thoroughly washing the filter with water, the bulked filtrate is neutralized. A few drops of $CaCl_2$ is added, and the precipitated CaC_2O_4 removed by filtration. The filtrate is again neutralized in a tared beaker with N/2 AmOH and made up to 70 c.c., heated to boiling, and treated with 0·5 Gm. of sodium nitroprusside. After setting aside for a time, the precipitated quinine nitroprusside is collected on a tared filter, washed and dried, with the beaker. The weight obtained multiplied by 1·03 gives the equivalent of quinine sulphate. To this the correcting factor of + 50 Mgm. is added for loss as oxalate and for the solubility of the nitroprusside. The precipitate obtained with nitroprusside from a mixture of quinine and cinchonidine salts is absolutely pure quinine nitroprusside.

Sabadilla Seeds, Variable Alkaloidal Value of. F. Koenig. (*Apoth. Zeit.*, 1913, **28,** 174.) Having received a sample of powdered sabadilla seeds which assayed only 1·286 per cent. of alkaloids by Caesar and Loretz's method, the author examined other trade samples of the powdered drug. These varied in alkaloids from 2·863 to 3·520 per cent. The prices of the powders had no relation to their alkaloidal value. Probably a limit of 3 per cent. of alkaloids would not be a too stringent requirement for this drug, since out of ten samples seven were over that amount and one more contained 2·918 per cent.

Sparteine, New Salts of, and of α-methyl Sparteine. L. Corriez. (*Bull Sci. Pharm.*, 1913, **19,** 468, 547.) The neutral and basic chlorate, and neutral and monoperchlorate, bichromate, and neutral salicylate are described, as well as a number of salts of α-methyl sparteine.

Stemona Sessilifolia, Chemical Constituents of, Root of. T. Furuya. (*Yakuakuzasshi*, 1912 [368], 1 ; *J. Pharm. Chim.*, 1913, **7**, 132). The plant has been long used in Japan as a remedy for pulmonary affections, and as an insecticide. The smoke from the burning leaves is used to destroy insects on fruit trees. A decoction of the plant is also used as a wash to remove human pediculi. The root is found to contain an alkaloid, *hodozurine*, $C_{19}H_{31}O_5N$, so called from "hodozura" the Japanese name for the plant. It forms a crystalline hydrobromide, $C_{19}H_{31}O_6N{\cdot}HBr$; m.p. 258–259°C. readily soluble in MeOH and in water ; less soluble in EtOH and in petroleum

Et_2O. The crystalline hydrochloride melts at 244–247°C. The root yields only 0·017 per cent. of the base.

Thalleioquin Reaction. C. H. La Wall. (*Amer. J. Pharm.*, 1912, **84,** 484.) After a complete historical review of the published literature of the test the following modification of Nelden's method of carrying it out is advocated. The following is the reagent employed which should not be more than some weeks old. Potassium bromate, 0·5 Gm.; Hydrobromic acid diluted (10 per cent.), 10 c.c.; water, q.s., to make 100 c.c.

Dissolve the potassium bromate in the diluted hydrobromic acid and when the solution is complete add the water.

Take 100 c.c. of the quinine solution in a Nessler tube or a tall cylindrical bottle, add 5 to 10 drops of the reagent mentioned above, agitate well and immediately add 10 drops of stronger AmOH solution and again agitate. In a dilution of 1 in 10,000, viewed in a column 5 c.m. deep, the tint is that of No. 376 *vert bleu* (Code des Couleurs, Klinksieck et Valette), while in a 1 in 50,000 solution view in the same manner, the tint is 336 *vert*, and in a 1 in 100,000 solution, similarly observed, the tint is 303 c. *vert*.

The following is the best method for applying the test, the solution of a drug or a fluid extract:

To 1 c.c. of the liquid or 1 Gm. of the solid add 20 c.c. of Et_2O in a large stoppered test tube. Make alkaline with AmOH and shake well. After separation pour off the ethereal solution as completely as possible into a watch glass and allow it to evaporate. Take up the residue with 1 c.c. of N/10 H_2SO_4 dilute with water to 15 c.c., transfer 5 c.c. to a tall cylindrical bottle and dilute to 100 c.c., add 5 drops of the above bromine reagent, agitate well, add 10 drops of ammonia water, agitate again. Compare the colour with the same volume of plain water. If the first test is negative, make another, using 10 c.c. of the acid alkaloidal solution, diluted to 100 c.c. as before. If no green colour is produced in either of these tests, cinchona alkaloids are absent or present in an amount less than ·0001 Gm. Sometimes it will be found necessary to purify the alkaloid by a second shaking out with ether.

The reaction is not interfered with by the presence of a large number of drugs which are enumerated.

Xanthoxylum Brachyacanthum, Alkaloids of. H. A. D. Jowett and F. L. Pyman. (*Proc. Chem. Soc.*, 1913, **29,** 26.) The

bark of *Xanthoxylum brachyacanthum* contains 0·06 per cent. of γ-homochelidonine, and a quaternary base, which was isolated in the form of its chloride, $C_{21}H_{24}O_4NCl,H_2O$, in a yield of 1·85 per cent. The properties of this salt suggested that it was one of the methochlorides of *l*-canadine. A quantity of the latter alkaloid was therefore methylated, and the *α*- and *β-methochlorides* were separated, when it was found that the former was identical with the salt from *X. brachyacanthum*. The physiological examination of *l*-canadine *α*- and *β*-methochlorides, showed that both possessed a curare-like action.

Zygadenus Intermedius, Alkaloid of. F. W. Heyl, F. E. Hepner, and S. K. Loy. (*J. Amer. Chem. Soc.*, 1913, **35,** 258.) By extracting a large quantity of the leaves of *Zygadenus intermedius* with EtOH 95 per cent. precipitating resin from the concentrated alcohol extract by pouring into water acidified with $H_2C_4H_4O_6$, an acid solution of crude alkaloids was obtained. This was washed with Et_2O, then made alkaline with Na_2CO_3, and shaken out first with Et_2O then after adding NaOH, with $CHCl_3$. The last traces of alkaloids were removed by shaking out with amyl alcohol. The Et_2O, $CHCl_3$ and amyl alcohol extracts were all shaken out with 1 : 20 aqueous $H_2C_4H_4O_6$ solution, but no definite separation of distinct alkaloids was obtained. By fractional crystallization of the mixed alkaloids from alcohol, 95 per cent., a crystalline alkaloid having the formula $C_{39}H_{63}NO_{10}$, named *zygadenine*, was obtained. It crystallizes from benzene in shining needles, m.p. 200°–201°C., and from alcohol in rhombic crystals containing alcohol of crystallization; very soluble in $CHCl_3$; sparingly soluble in Et_2O. An acid solution of the alkaloid precipitates Mayer's reagent and gives a crystalline chloro-aurate. With concentrated H_2SO_4 it gives a yellowish orange colour changing to a brilliant cherry-red. Its physiological acton resembles that of veratrine.

ANIMAL PRODUCTS

Cerebrone, Isolation and Purification of. A. Lapworth. (*Proc. Chem. Soc.*, 1913, **29,** 175). The following method is found to be most satisfactory to extract the material, partly dried in spirit, with boiling MeOH, to precipitate most of the phosphatic materials by neutralizing the hot liquid with methyl-alcoholic baryta, subsequently decanting

the clear, supernatant liquid, and destroying the remaining phosphatides by adding excess of powdered BaO and boiling for several hours. The solvent is then mostly removed, and the residue rendered slightly acid with glacial acetic acid in the presence of $CHCl_3$, which is subsequently removed by distillation, and the cerebrone, mixed with cholesterol, extracted by MeOH. Complete separation of phosphatides and cholesterol from the cerebrone may be effected in several ways, of which continuous extraction with boiling acetone is the most efficient.

Cydnus Indicus, Constituents of the Oil of. E. R. Watson. (*Proc. Chem. Soc.*, 1913, **29,** 28.) The strong and unpleasant odour of the insect *Cydnus indicus* is due to an oil which it secretes. The oil has been found to contain a large percentage of a non-volatile oil of the same general character as other animal oils. It also contains about 1·5 per cent. of an oil which is volatile with steam. This consists of an acid, $C_8H_{14}O_2$, probably *cyclo*-heptanecarboxylic acid, and a small quantity of a non-acid substance ($C_{11}H_{20}O_2$?). The acid has a strong rancid odour; and the non-acid volatile substance has a still stronger odour.

Egg Albumin, Colour Reaction for. L. Lewin. (*Berichte*, 1913, **46,** 1796.) A 1 to 1·5 : 1,000 solution of triformoxime in strong commercial H_2SO_4 gives a bright permanent violet colour on being shaken with egg albumin solution. With pure acid the colour does not occur, but a brown colour with a slight green fluorescence is given. Probably the Se present in the crude acid plays a part in the reaction. On adding SeO_2 to a solution of triformoxime in pure H_2SO_4, the violet colour is satisfactorily developed.

Egg Yolk, Crystalline Colouring Matter from. — Willstaetter and — Esch. (*Wien. Klin. Rundsch.*, 1912, 254; *Répertoire*, 1912 [3], **24,** 542.) By the successive use of selective solvents, the authors have succeeded in isolating the yellow colouring matter of egg yolk in a crystalline form. It is closely allied to xanthophyllin, and has been named *lutein*. The yield is very small: 6,000 yolks have given only 4 Gm. of the pure crystals. (See also *Y.B.*, **1908,** 74.)

Furs, Microscopical Structure of Animal Hairs of. E. Collin. (*J. Pharm. Chim.*, 1913, **7,** 97.) A description of the micro-appearance of the hairs of the skins of certain fur-bearing animals

with illustrations of typical structure of the hairs of skunk, American opossum, chinchilla, and rabbit skins.

Gelatin, Chemistry and Quantitative Determination of. M. Berrár. (*Biochem. Zeits.*, 1912, **47,** 189; *J. S. C. I.*, 1913, **32,** 37.) The solubility of purified gelatin in cold water is 0·56, 0·60 and 0·62 per cent. at temperatures of 17°, 18° and 21°C. respectively. These concentrations are not very different from the lowest required for the formation of a jelly; for example, a 0·7 per cent. solution in hot water sets to a thin jelly on cooling. Neither EtOH nor metaphosphoric acid precipitates gelatin completely from aqueous solutions. The same is true of picric acid at the ordinary temperature, but at 8°C. complete precipitation may be effected by adding an equal volume of a saturated aqueous solution of picric acid. When gelatin is completely precipitated by acid reagents, *e.g.*, by a solution containing picric acid and potassium mercuric iodide (the precipitate may in this case be safely washed with water), the gelatin combines with acid in a definite proportion, viz., one molecular equivalent of acid to a quantity of gelatin containing ten atoms of nitrogen. Assuming that one molecular equivalent of acid unites with one molecule of gelatin, the molecular weight of the latter must be 823 (Paal found 900). The nitrogen content of picric acid, or of precipitates containing this compound and proteins or gelatin, may be determined accurately by a modification of Kjeldahl's method. The material is treated in a Kjeldahl flask, with 0·5—1 Gm. of iron filings, 5 c.c. of glacial acetic acid, 20 c.c. of concentrated H_2SO_4 and some $CuSO_4$; the mixture is heated in the ordinary way, and the subsequent operations carried out as usual. In aqueous solutions gelatin may be completely separated from proteins, albumoses, peptones, mucin and casein, by adding about 2 volumes of a mixture of 1 part of a saturated aqueous solution of picric acid with 4 parts of 96 per cent. EtOH. The gelatin alone remains in solution, and after filtration it may be quantitatively precipitated by adding about 1½ volumes of a saturated aqueous solution of picric acid and allowing the mixture to stand for 12 hours at 10°C. By this means quantities of gelatin admixed with milk and egg albumin have been accurately determined. The gelatin-picric acid precipitate was washed with a solution of potassium mercuric iodide until the washings were no longer yellow in colour: the quantity of gelatin in the residue was found by determination of the nitrogen-

content. The method described above may be applied to the qualitative detection of gelatin in presence of proteins. After precipitating the latter by the alcoholic-aqueous picric acid solution, and filtering, the presence of gelatin in the filtrate, even at a concentration of 1 in 100,000, is indicated by a yellowish white opalescence formed on addition of an aqueous solution of picric acid. The opalescence is best detected by a "ring-test."

Lecithin, Determination of, in Preparations. R. Cohn. *Z. Öffentl. Chem.*, 1913, **19**, 54; *J.S.C.I.*, 1913, **32**, 307.) From 1 to 2 Gm. of the lecithin preparation, or from 5 to 20 Gm. of a food containing lecithin, is mixed with 100 c.c. of 96 per cent. EtOH and shaken repeatedly for a few hours; the EtOH is then separated and the residue is boiled for some hours with a further quantity of EtOH under a reflux condenser. The residue is then ground up with sand, and the hot extraction is once more repeated. The insoluble portion is, finally, extracted for 2 hours with boiling $CHCl_3$. Lecithin preparations which have been kept for a long time, or which have been overheated, require to be extracted with hot EtOH for some 20 to 30 hours before they cease to yield EtOH-soluble phosphorus compounds. The united EtOH extracts are evaporated, the $CHCl_3$ extract is added and also evaporated, and the residue is digested for 2 hours with about 100 c.c. of $CHCl_3$ in order to separate the lecithin from free H_3PO_4, glyceryl-phosphoric acid, etc.; the $CHCl_3$ solution is then filtered and evaporated. For the determination of the P_2O_5 in this residue, the latter is either incinerated with the addition of Na_2CO_3 and KNO_3, or of MgO, or oxidized by heating with H_2SO_4 and HNO_3; the resulting P_2O_5 is precipitated with magnesia mixture and weighed as magnesium pyrophosphate. If desired, an intermediate precipitation with molybdic acid may be made. These methods all yield accurate results, but the method in which the residue is ignited with MgO is recommended. The quantity of P_2O_5 found is multiplied by the factor 11·36 to give lecithin. The author has examined many lecithin preparations and finds that whilst products manufactured by reputable firms contain from 95 to 98 per cent. of lecithin, others guaranteed to contain upwards of 91 per cent. yield far less. Foods stated to contain a certain percentage of lecithin should yield within 9 per cent. of the guaranteed amount. Products sold as soluble lecithin and prepared by the saponification of lecithin consist of a

mixture of glyceryl-phosphoric acid, choline, glycerol, and sodium chloride, and are not true lecithin preparations.

Milk, Detection of Benzoic Acid in. C. Revis. (*Analyst*, 1912, **37,** 346). One hundred c.c. of the milk is diluted with 100 c.c. of water; after adding 5 c.c. of 1 : 10 Na_2CO_3, the mixture is boiled for 5 minutes. Ten c.c. of 1 : 5 $CaCl_2$ is then added and boiling continued until coagulation is complete. When cold, the liquid is filtered and the filtrate made neutral to litmus paper with HCl. Ten c.c. of Fehlings $CuSO_4$ solution, unmixed with tartrate, is then added, followed by 10 c.c. of KOH solution (31·18 Gm. KOH in 1 litre). The liquid is then filtered into a separator, acidified with HCl and shaken out with Et_2O. After washing it with water, the Et_2O extract is shaken out with $Ba(OH)_2$ solution in slight excess as indicated by a drop of phenolphthalein indicator. The aqueous layer is then withdrawn, concentrated to about 5 c.c. and neutralized with dilute acetic acid, two drops in excess being added after the discharge of the pink colour. The solution is then tested with fresh solution of $FeCl_6$. This will detect 0·02 per cent of benzoic acid.

Milk, Preservation of, for Analysis by Means of Phenol. G. Denigès. (*Annales des Falsific.*, 191 [12], *Repert.*, 1913, **25,** 106.) Dubois has previously recommended the addition of 1 part of liquid phenol (0·50 Gm. of phenol; 10 c.c. of alcohol 95 per cent.) to 100 parts of milk as a means of preserving it for analysis. The author finds this device to be very effective. The phenol does not affect the determination of the acidity nor of the milk sugar. It is extracted with the fat by Adams' method; but is entirely volatilized on drying the butter fat. Obviously, in measuring off the portions of milk for analysis, allowance must be made for the slight increase of volume due to the phenol added. The following figures obtained with a sample of milk thus preserved for ten years indicate the value of the method. Acidity, in terms lactic of acid, original analysis, 1900, 0·18 per cent.; in 1910, 0·185 per cent. Lactose, 1900, 4·685; 1910, 4·640. Fat, 1900, 3·812; 1910, 3·790. Casein, 1900, 3·200; 1910, 3·200. Ash, 1900, 0·68; 1910, 0·675. Extractive, 1900, 12·6; 1910, 12·64.

Milk and Cream, Rapid Method for Determination of H_3BO_3 in. F. W. Richardson and W. K. Walton. (*Analyst*, 1913, **38,** 140.) Five c.c. of 1 : 20 solution of $CuSO_4$ is

added to 50 c.c. of milk, or 10 Gm. of cream mixed with 40 c.c. of water. After well stirring and boiling for a few seconds, the coagulum is filtered out, and washed four or five times with boiling water. To the cold aqueous liquid 2 c.c. of a 1 : 100 neutral solution of phenolphthalein is added and N/10 NaOH until a blue shade appears. About one-third the volume of glycerin is then added, and the titration is proceeded with again with N/10 NaOH until the blue shade again appears. Each c.c. of N/10 NaOH thus used up = 0·0071 Gm. of boric acid.

The fat in cream may be estimated in the above coagulum. It is dried *in situ* on the filter, over a tared flask, in the water oven. Most of the fat filters through into the flask. The dry filter and coagulum is then transferred to a Soxhlet, which is connected to the flask, and extracted with petroleum ether. When extracted, the flask with the fat should be dried in the water oven for 3 to 4 hours.

Milk, Determination of Benzoic Acid in. J. F. Liverseege and N. Evers. (*J.S.C.I.*, 1913, **32,** 319.) One hundred c.c. of milk is mixed with 10 c.c. of strong H_2SO_4 and distilled in a current of steam until 600 c.c. have passed over. To the distillate 5 c.c. of concentrated HCl is added, after which it is shaken successively with 100, 35, and 35 c.c. of Et_2O. The Et_2O extract is allowed to evaporate spontaneously in a tared glass dish, and after the latter has remained in a desiccator for a day the dish and residue are weighed. From the weight of the residue 5 Mg. is subtracted to correct for the blank obtained with milk free from the preservative in question.

In order to prove that the residue is actually benzoic acid, the authors recommend a modification of Halphen's test as follows :

To the residue in an evaporating dish is added 1 c.c. of strong H_2SO_4 and 0·2 c.c. of strong HNO_3. The dish is gently heated over a low flame so that the liquid fumes moderately for three minutes. If a deep yellow colour is formed before the end of the time the heating is at once stopped. When cool about 5 c.c. of water is added and the liquid is poured into a 50 c.c. Nessler cylinder, the dish being further washed with about 3 c.c. of water. One c.c. of a saturated solution of Na_2SO_3 is mixed with the liquid and then 10 c.c. of about N/6 AmOH is added while cooling. A brown colour indicates the presence of benzoic acid. Finally 2 c.c. of AmHS is added, when a deep red colour is produced. The liquid is then diluted with water to 50 c.c.

and compared with standards prepared in the same manner. In a particular experiment standards of 3, 5, and 7 Mg. of benzoic acid were made. A milk residue to which 5 Mg. of benzoic acid had been added indicated about 4·5 Mg. on comparison with them.

Thyroid Gland, Seasonal Variation in the Iodine Content of. A. Seidell and F. Fenger. (*J. Biol. Chem.*, **13,** 517.) A seasonal variation in the I of normal glands was found to occur. From June to November there is present three times as much I as in December to May. The size of the fresh glands also changed in cattle and sheep but not in hogs. The larger glands contained less I. The proposed U.S.P. standard of 0·2 per cent. I in desiccated thyroids cannot be reached by the use of sheep glands alone nor by cattle and hog glands unless the products of the high and low season of the year are mixed.

CLINICAL TESTS

Blood, Detection of Uric Acid in. M. A. Schittenhelm. (*Pharm. Zeit.*, 1912, **57,** 918.) KH_2PO_4, 10 Gm., is dissolved in water 1,000, and 10 c.c. of formaldehyde is added. Into this mixture, blood, 100 c.c. or more if possible, is poured. After boiling for some time the liquid is filtered, and the precipitate washed with hot water. The bulk liquid is evaporated to 100 Gm. and treated with $NaC_2H_3O_2$, 2 Gm; and solution of $NaHSO_4$ 10 c.c. The mixture is then heated to boiling and after adding 10 c.c. of a 1 : 10 solution of $CuSO_4$ boiling is continued for 3 minutes. The precipitate is collected, washed and suspended in about 100 c.c. of water, heated to boiling and treated with a current of H_2S. Dilute HCl is added and the acid liquid filtered after warming. After filtering, the filtrate is evaporated to a few c.c. and treated with HNO_3 for the murexide test. The red colour does not form at the bottom of the capsule, but at the sides in the form of a ring.

Blood, Diet for Detection of, in Cases of Occult Gastric Bleeding. I. Boas. (*Deutsch. Med. Woch.; B.M.J. Epit.*, 1913, **1,** 29.) The difficulty of determining the source of small quantities of blood in faeces, whether this may be due to flesh food eaten, or to internal bleeding, may be eliminated by a diet of meat in which the haemoglobin is decomposed. From 100 to 125 Gm.

of minced or scraped meat is treated in a porcelain dish with 100 c.c. of 3 : 100 H_2O_2 solution. The mixture is well stirred until a snow-white meat is obtained, a considerable effervescence being produced. The meat is then well washed on a sieve and made into croquettes. The patient is directed to take a purge before commencing the above regimen. While taking this meat, all other forms of flesh should be excluded from the diet. If after two or three days of this diet, any blood is found in the faeces, it is certainly of endogenous origin.

Blood Specimens, Preparation of, for Diagnosis. (*Evans' Journ.*, 1912, **1**, 14.) An illustrated article giving full details of the methods of obtaining and preparing blood films for clinical examination.

Blood Stains, Value of the Guaiacum Test for. H. S. Shrewsbury. (*Analyst*, 1912; *Chem. News*, 1912, **106**, 302.) The guaiacum test is the most useful of sorting tests for blood. It is only characteristic when the following conditions are satisfied. The stain must give a red aqueous extract yielding no coloration to a straw-coloured solution of guaiacum in rectified spirits when applied by itself, but a blue coloration within one second on the further addition of H_2O_2. The last two conditions are emphasized. Oxidizers and enzymes give a reaction with guaiacum solution alone, but this is not the case with blood. It is very necessary that the reaction should occur within one second, as even guaiacum solution and H_2O_2 by themselves will develop a faint colour on standing. Tested correctly, the author finds that none of the thirty substances mentioned by Sutherland in his monograph on bloodstains give a characteristic blood test. The majority took time for the development of colour, the time varying from five seconds to several minutes. Excluding the condition of a soluble red extract, out of the thirty substances only the following gave a correct reaction:

Old bleaching powder, certain enzymes, ammonium chloride, sixteen per cent. salt solution; dilute solutions of copper sulphate.

Weaker solutions of common salt than 14 per cent. gave no colour; consequently there is no danger from the minute quantity of salt present in the liquids of the body. Among commonly occurring enzymes those contained in maize or wheat flour satisfy these conditions, and if combined with a soluble red stain might be misleading. In two years' experience of the examination of a considerable number and variety of articles of clothing

the guaiacum test has always been found to be confirmed by other reactions for blood. It is pre-eminently useful as a sorting test when much clothing has to be thoroughly examined, and though never to be relied on as proving blood, may be accepted as a perfectly satisfactory negative test, except under extraordinary circumstances. Although a great number and variety of vegetable stains occurred on the clothing examined, there was never any complication on account of the reaction of enzymes. Possibly the guaiacum reacting property of the enzymes is eliminated during the drying of stains. Further experiments suggest that it is most difficult for a washed bloodstain to escape revelation by the guaiacum test, and that with washed bloodstains the test is highly specific, if not absolute proof of the presence of blood, though not of course characteristic of human blood.

Diphtheria Bacillus, Direct Microdetection of with a New Stain. C. Ponder. (*Lancet*, 1912, **183,** 22.) The stain has the following composition: toluidin blue (Grubler), 0·02 Gm.; glacial acetic acid, 1·0 c.c.; absolute alcohol, 2·0 c.c.; distilled water to 100·0 c.c. A film is made on a cover-glass and fixed in the usual way. A small quantity of the fluid having this composition is taken up with a platinum loop and dabbed and spread on the film; the cover-slip is then turned over and mounted as a "hanging-drop" preparation, and it is then ready for immediate examination with the 1/12th oil immersion lens. The examination should be made with a strong artificial light. Films should be freshly prepared and thinly spread; the drop should be rather shallow—not too deep so that its blue shade cuts off too much of the light, nor so little in amount that there is not sufficient stain for the organisms to become fully saturated. The cells take up the stain practically instantaneously, and the preparation may be examined at once or any time during the next three or four hours; after that there is a tendency for overstaining to take place. The method has the great advantage that it enables a prompt diagnosis to be made.

Faeces, Simultaneous Detection of Urobilin and Bilirubin in. A. Grigaut. (*Comptes rend. Soc. Biol.: L'Union Pharm.*, 1913, **54,** 235.) The faeces, suspended in boiling water, are treated with an equal volume of HCl, and a few drops of Fe_2Cl_6 solution, diluted 1 : 10, are floated on the surface. Two layers are thus formed. The lower, in presence of urobilin will have a pink tint; a green colour in the upper layer denotes bilirubin.

Faeces, Detection of Stercobilin or Stercobilinogen in. P. Descomps. (*L'Union Pharm.*, 1913, **54,** 84.) Stercobilin is a synonym for hydrobilirubin and urobilin, or Jaffe's pigment. In practice the first name is applied to the pigment from faeces, and the term urobilin to that from urine. Gilbert and Herscher detect stercobilin or stercobilinogen in faeces as follows: A few Gm. of the material is rubbed down with amyl alcohol and tested with 1 : 1,000 alcoholic zinc acetate solution; if no green fluorescence appears, stercobilin is absent. A few drops of Gram's reagent are added, if fluorescence then appears the pigment is present as stercobilinogen. If both occur the fluorescence at first apparent will be increased by the addition of Gram's test. If $CHCl_3$ is used as the extracting solvent, the addition of a few drops of nitrous HNO_3 gives a red colour when stercobilin or stercobilinogen are present. (See also *Y.B.*, **1912**, 52.)

Faeces and Stomach Contents, Microdetection of Fat and other Elements in. A. Friediger. (*Muench. Med. Woch.*, 1912, [52]; *Pharm. Zeit.*, 1913, **58,** 128.) A reagent is prepared containing: Saturated alcoholic solution of dimethylamidobenzene, 2 c.c.; absolute alcohol, 2 c.c.; 1 : 200 solution of eosin in alcohol, 7 per cent. 2 c.c.; glacial acetic acid, 2 c.c.; Lugol's solution (KI,2; I, 0·5; glycerin, 20), 20 drops; saturated aqueous solution of mucicarmine, 20 drops. The material spread out under a cover glass is deprived of as much water as possible by draining with filter paper. When the paper will take up no more moisture, the cover glass is removed and the material treated with a few drops of the stain. The cover glass is again put on, and excess of stain drained off with filter paper. On examining the preparation under the microscope, fat will be seen as lemon yellow or ochre coloured; starch will be blue to violet; bundles of muscular fibre orange to deep carmine; yeast cells or sarcinae, also red, but distinguishable by their form; Jaworski's corpuscles are not stained.

Faeces, Detection of Blood in. D. J. K. Wetselar. (*Pharm. Weekblad*, 1912 [47]; *Pharm. Zeit.*, 1913, **58,** 128.) A piece of the material the size of a walnut is rubbed down with a mixture of equal volumes of EtOH and Et_2O, filtered, and the residue again treated with the same solvent until a colourless filtrate is obtained. The insoluble matter is then extracted on the filter with 4 c.c. of glacial acetic acid; and when this has drained off, with another 4 c.c. of the same. The bulked filtrate is transferred

to a 100 c.c. separator, mixed with two to three times its volume of Et_2O, and then shaken with so much water as will make the separated liquids half Et_2O layer and half water. The acid aqueous layer is run off the Et_2O, is washed with water, and then treated with 5 to 10 drops of freshly prepared pale yellow solution of guaiacum resin in EtOH, and 20 drops of H_2O_2, or of oxidized turpentine oil. In the presence of blood a blue to deep violet or purple colour will soon develop. (See also *Y.B.*, **1907,** 25, 26 ; **1908,** 34 ; **1912,** 49, 52.)

Faeces, Detection of Fat in. L. Saathoff. (*Muench. Med. Woch.*, 1912 ; *B.M.J. Epit.*, 1913, **1,** 64.) All faeces contain fat. During fasting, as much as 33 per cent. of the total dry solid matter excreted may be fat, chiefly in the form of a K soap. In normal individuals, the amount excreted is about 20 per cent. of the total solids. To detect fatty matter the following method is recommended : A piece of faeces of about the size of a pea is roughly rubbed down on a microscope slide. If the motion is thin or fluid, it may be advisable to heat the slide over the spirit lamp until a tenacious consistence is attained. Two or three drops of Sudan III solution are now applied, and the whole well rubbed together. The Sudan III solution is prepared by mixing 90 c.c. of glacial acetic acid and 10 c.c. of a 96 per cent. alcohol and dissolving as much of the dye as can be placed on a threepenny-bit in this. As soon as the mixture with the faeces is homogeneous and equally stained red, a cover-glass is placed on it and pressed firmly to leave only a thin film. The slide is then heated for half a minute over the flame, but not so hot that boiling takes place. It is then placed under the microscope for examination with a high magnification. All the fat is now visible, either as yellow or any colour up to intense red globules. These are readily recognized in contrast with the pale yellow background. The stained fat loses its colour on cooling, and colourless crystals appear. Reheating revives the intense colouring. The author has set up a general scheme whereby the approximate quantity of fat in a stool can be estimated in this manner.

Gram Technique, A Simplified. — Snyder. (*Annals Ophthalm.*, *B.M.J. Epit*, 1913, **1,** 96.) Staining by Gram's method is apt to be neglected, chiefly because the solution of gentian-violet in aniline oil rapidly deteriorates, and dirty specimens are the result of an attempt made with a partly-spoilt solution. The author substitutes methyl violet with satisfactory results.

Methyl-Violet Stain : Melted carbolic acid crystals, 12.5 c.c. ; Absolute alcohol, 25.0 c.c. ; Methyl-violet 6 B (Gruebler), 1.0 Gm. Dissolve, keep in a warm place for twenty-four hours, and filter.

Lugol's Solution : Iodine, 1 part ; Potassium iodine, 2 parts ; Distilled water, 300 parts.

The following method is recommended for staining smear preparations : A drop of formalin solution 1 in 1,000 in distilled water is placed upon the slide, and some of the secretion is evenly mixed with it. A drop of absolute alcohol is now placed upon the original drop to fix the slide. The author finds that alcohol fixation is superior to the flame method. When the alcohol evaporates, a thin smear is left. Three or four drops of distilled water are placed upon the smear, and one drop of the methyl-violet stain is added. This is left for twenty-five seconds, and then washed off under the tap. Lugol's solution is now added, and after fifteen seconds the smear is decolourized with absolute alcohol. Now wash again under the tap and counterstain with a 5 per cent. watery solution of safranin or weak fuchsin for five seconds. Wash again, dry and examine, either with cedar oil alone or after a coverslip has been laid upon a drop of Canada balsam. It is best, however, not to use a cover-glass at all. The solutions keep indefinitely, and are always ready. The author describes a loop made of platino-iridium wire for taking up secretion from the eye and from other situations. Those who work in hot countries where the aniline solution decomposes in a couple of days will appreciate the advantages of this stain.

Haemin Crystals, New Reagent for Microdetection of Blood by. — Nippe. (*Deuts. Med. Woch.*, 1912, 2222 ; *Apoth. Zeit.*, 1912, **27,** 931.) The following affords a ready means for obtaining micro-crystals of haemin for the detection of blood and the identification of blood stains. KBr, 0·1 Gm. ; KI, 0·1 Gm. ; KCl, 0·1 Gm. ; glacial acetic acid, 100 Gm. A drop of the solution of the stain in this reagent, placed on a micro-slip and covered with a cover glass, is heated until small bubbles begin to form. As it cools the formation and growths of the typical haemin crystals may be watched under the microscope. If excess of liquid be drained away or evaporated off, and the residue dried, the crystals may be mounted in Canada balsam.

Mercury in the Hair. (*Lancet*, 1912, **183,** 1737.) It is possible

to detect mercury in the hair of persons who have undergone mercurial treatment. The process is said to be capable of detecting 1 part of Hg in 90,000,000 parts of hair, while only from 2 to 10 Gm. of the hair are necessary for the purpose. After removal of greasy substances by washing with Et_2O, EtOH, and water, the hair is digested in HCl, $KMnO_4$ being added to destroy organic matter. Complete solution takes place eventually, and the fluid which contains $HgCl_2$, if Hg is present in the hair, is filtered. H_2S is then passed through the clear solution and the precipitated HgS collected. The sulphide is then treated with HCl and $KClO_3$ and the solution filtered and evaporated to a small bulk. A strip of Cu foil is then placed in the solution, which is gently boiled. Hg, if present, is deposited upon the Cu. The Cu foil is dried and placed in a tube, one end of which terminates in a capillary form. The tube is exhausted of air and sealed. The part in which the copper slip is situated is then heated over a flame, which will cause the Hg to volatilize and condense in the capillary portion of the tube. Microscopical examination will then show any globules of mercury present. When these are treated on a glass slide with a little iodine and examined under the microscope the formation of HgI_2 may be observed.

Metals, Occurrence of, in the Human Liver. L. van Italie and J. J. van Eck. (*Archiv. Pharm.*, 1913, **251**, 50.) As is found not to be a normal constituent of the human liver. In twenty-two cases, a trace occurred only twice; 0·06 Mgm. i. 1 kilo of liver, once; and 2·63 Mgm., one. In the last the subject had taken As_2O_3 medicinally before death. Cu and Zn are constantly present. In 1 kilo of liver of a child of 5 weeks, there was 8 Mg. of Cu and 55·7 Mgm. of Zn. The smallest quantity of Cu found was 2·9 Mgm. per kilo in a child of 5 years; the most in the foetal liver: in that of a child only a few hours old there was 30 Mgm. per kilo. Zn does not show such a marked fluctuation; but the lowest amount was 17·7 Mgm., and the highest 67·8 Mgm. per kilo.

Microbiology, Pathological Chemistry and Microscopy in Relation to the Pharmacist. R. T. Hewlett. (*Pharm. J.*, 1913 [4], **36**, 93, 248, 398.) A series of lectures addressed to pharmacists dealing mainly with practical bacteriology and

sterilization, pathological microscopy, the preparation and dosage of antitoxins, sera, and vaccines.

Micropipette for Chemical and Pathological Work. A. Stephan. (*Apoth. Zeit.*, 1912, **27,** 754.) The pipette illustrated, designed by Kuester, is very useful for the examination of sputum for tubercle bacillus by the antiformin and petroleum ether method, as well as for urological and other microscopical work.

The pipette consisting of the usual tube of fine bore, is of 1 c.c. capacity, and is graduated in 0·1 and 0·01 c.c.'s. The metal cap contains a plunger worked by a fine screw, and a vent, so that charging and discharging can be manipulated with minute accuracy for fractions of a drop of liquid.

Sputum, The Chemical Examination of. Kleissel. (*Wien. Med. Woch.*, Nos. 21–22, 1912; *B.M.J. Epit.*, 1912, **2,** 41.) It is pointed out that as long ago as 1855 Biermer noticed that the more acute the inflammatory process is, the greater is the amount of albumin in the sputum. Later Bamberger found that in catarrhal conditions, such as phthisis and chronic bronchitis, the sputum contained more K than Na salts, while in exudative processes, such as pneumonia, the reverse was the case. Kossel showed that the sp. gr. of the sputum varied with the amount of pus it contained: and that a serous sputum, being an exudation from the blood rather than a secretion, has the highest sp. gr. of any. He found a peptone in all purulent sputum, attributing its formation chiefly to the action of a ferment therein contained. This opinion was confirmed by Filehne. The author's method is to mix the specimen of sputum with an equal part of water, and after acidifying with acetic acid to beat it up well with a glass rod. The mucus becomes ropy, and is filtered off. The filtrate is boiled repeatedly, a small quantity of concentrated NaCl solution is added to ensure the precipitation of the albumin. The remaining clear solution is then tested for peptone by the biuret reaction. The author examined the sputum of about 60 patients in a military hospital in this way. Of 25 cases diagnosed as bronchitis, all but 4 gave a negative

result with the test, and in those 4 the constitutional symptoms justified a suspicion of phthisis, although no bacilli were found. In 22 cases of apical catarrh, in which von Pirquet's test was positive but no bacilli were found, the biuret reaction showed peptone in all but two. In 6 other cases of undoubted phthisis the test was positive in all, though in one of them peptone was not present in the sputum until an improvement had taken place in the condition of the patient. On the other hand, in pneumonia, of which the author mentions 2 cases, the biuret reaction is positive at the height of the attack; but after the crisis the peptone rapidly disappears from the sputum. Four cases of pleurisy showed no biuret reaction, except in one, where there were signs of tuberculous disease in the lung. The author specially deprecates the inference that the biuret reaction is indicative of phthisis; but he claims that it will give valuable help in the diagnosis of those cases in which the physical signs differ but slightly from normal, while the subjective symptoms suggest some latent pulmonary disease.

Spirochaeta Pallida, Collargol in Dark Background Illumination of. (*B.M.J.*, 1912, **2,** 1547.) L. W. Harrison uses a suspension of collargol, 1, in distilled water, 19, in place of the emulsion of Chinese Ink recommended by Burri for the detection of *Spirochaeta* by the ultra-microscope. One drop of the emulsion is mixed with one drop of the material to be examined and spread into a thin film which is allowed to dry. The organisms appear on an almost perfectly homogeneous, reddish-brown ground and are very easily seen.

Spirochaeta Pallida, Rapid Method of Staining. A. Fontana. (*La Presse Medicale*, 1912, 784; *Med. Review*, 1913, **16,** 36.) The scraping to be examined is diluted with a drop of distilled water, spread on a slide and fixed in the flame. A few drops of a 5 per cent. solution of tannin in distilled water is then applied and heated for 30 seconds till slight vapour rises, the specimen being then washed in running water for a further period of 30 seconds. A few drops of a solution containing $AgNO_3$, 5, AmOH solution, 9, in distilled water, 100, is then applied and heated in the flame for 20 or 30 seconds according to the intensity of staining desired. The whole process occupies 70 to 80 seconds, and is not only rapid but produces a remarkably intense degree of staining for *Spirochaeta pallida* and several other varieties of Spirochaetes.

Spirochaeta Pallida Staining. Triboudeau (*Bull. Soc. Franc. Derm. et Syph., Brit. Med. Journ. Epit.*, 1913, **1**, 16.) Three solutions are required: (*a*) A fixative, (*b*) a mordant and (*c*) an $AgNO_3$ solution. Solution *a* consists of: Solution of formaldehyde (40 per cent.), 2 Gm.; pure acetic acid, 1 Gm.; distilled water, 100 c.c. Solution *b*: tannin, 5 Gm.; distilled water, 100 c.c. Solution *c*: $AgNO_3$, 1 Gm.; distilled water, 20 c.c.; to 15 c.c. of this AmOH is added drop by drop until the precipitate formed completely disappears; to this solution the remaining 5 c.c. of $AgNO_3$ solution is gradually added until a slight opalescence remains after shaking. The syphilitic material obtained after drying the lesion with cotton-wool and scarificating the edges until slight bleeding occurs, is spread on a slide and dried in the air. Fixation is effected by irrigation for one minute with (*a*), followed by a few drops of absolute EtOH and allowed to dry. The mordant (*b*) is allowed to act over a flame till just steaming for 30 seconds. The preparation is then washed with tap water for 30 seconds, excess poured off, and, without drying, the $AgNO_3$ solution is added, warming over a flame for 30 seconds; then washing in distilled water, and drying on blotting paper. The films should have a yellowish tint when finished.

Syphilis, Clinical Diagnosis of. (*Evans' Journ.*, 1912 [2] 35.) In this article the methods of preparation of specimens from syphilitic lesions for diagnosis, are detailed, the principles underlying Wassermann's serum test for syphilis are described, and the diagnostic value of the test in primary, secondary, tertiary, and parasyphilitic affections is indicated. The micro-appearance of *Spirochaeta pallida* is illustrated.

Tubercle Bacilli, Improved Method for Staining. — Marmann. (*Archiv. Hygiene*, 1912, **76,** [6]; *Schweiz. Woch.*, 1912, **50,** 620.) The following method is recommended for the detection of tubercle bacilli in sputum. (1) Heating the smear for 2 minutes, over the gas flame, in the following solution: saturated alcoholic solution of methyl-violet-B., 10 c.c.; in 100 c.c. of 2 per cent. phenol solution. (2) Maceration for 5 minutes in Lugol's solution. (3) Washing in water. (4) Immersion for 1 minute in 1 : 20 HNO_3. (5) Treatment for 10 seconds with 3 : 100 HCl. (6) Decolourizing with mixture of equal volumes of acetone and absolute alcohol until light blue. (7) Counterstain with dilute carbol fuchsine.

Tubercle Bacilli, Pikrin Method of Staining. H. Wilson. (*B.M.J.*, 1912, **2,** 413.) The pikrin method of staining tubercle bacilli, as set forth by Spengler, is worthy of more frequent employment in clinical work in this country. In simplicity it is not inferior to the Ziehl-Neelsen method, and, when carefully applied, it has a more far-reaching range of utility. It is far superior to the Ziehl-Neelsen method when applied to the examination of urinary sediments.

It is claimed for it that bacilli deprived of their waxy coating can be detected by this means, and also that degenerate, "splitter," or spore forms may be recognized which are unstained by the Ziehl-Neelsen method. As these spore formations under suitable conditions may develop into active virulent tubercle bacilli, it is of the utmost importance to recognize them in sputum from the point of view of infectiveness of a patient.

The centrifuged deposit, being pipetted on to a slide, is dried in a current of warm air some distance from the flame; and the film, which must be thin, then fixed by passing it a few times through the flame of the spirit lamp, taking care that it does not char. It is then stained carefully, without much heat. The bacilli appear bright red on a lemon-coloured ground, and, if present, are more perceptible than by any other method.

Spengler's method is simple, and is conducted as follows: Having made a suitable film as above—1. Stain with carbol fuchsin, warm, but without too much heat. 2. Pour off the stain without washing. 3. Pour on picric acid alcohol (consisting of equal parts of saturated solution of picric acid and absolute alcohol); after 3 seconds. 4. Wash with 60 per cent. alcohol. 5. Treat with 15 per cent. nitric acid till yellow (30 seconds). 6. Wash again with 60 per cent. alcohol. 7. Counterstain with picric acid alcohol till lemon-coloured. 8. Wash with distilled water and dry gently at a low heat.

With a little practice this will be found an easy and quick method, and the extra time involved in the staining will be more than compensated by the ease with which the bacilli are found if present, and the consequent less time spent at the microscope. This applies particularly to urinary sediments.

Typhoid Bacillus, Bactericidal Experiments on. — Hailer and — Ungermann. (*Centr. Bakt. Parasitenk., I Abt., Ref.* **54,** 67; *Chem Abstr. Amer. Chem. Soc.*, 1913, **7,** 101.) The authors

have tested a large number of chemicals for their power to kill typhoid bacilli in the rabbit. These tests included the phenols and phenol ethers of which *m*-xylenol and thymol, without being too toxic, caused a disappearance of the typhoid bacilli from the organs. Many of the compounds of this group were inactive (anethol-phenetol, carvacrol, guaiacol), while others were too toxic (chloro-*m*-cresol, tribromo-β-naphthol and oxyquinoline). The mode of administration of *m*-xylenol and thymol made a difference; from the rectum the absorption is rapid and directly into the circulation, whereas from the small intestine the liver is encountered and the compounds are chemically changed (combined with glucuronic acid, H_2SO_4, reduced, etc.). Rectal administration gave the best results. Of the 2 and 3 OH group combinations with the benzene nucleus, pyrocatechol, resorcinol and hydroquinone were inactive, while pyrogallol in aqueous solution *per os* had a remarkable action in two of three cases. Sodium salicylate injected intravenously acted fairly well in some cases and closely associated chemical compounds (*p*-hydroxybenzoic acid, acetylsalicylic acid, phenoxyacetic acid, phenolsulphonic acid, α- and β-hyhroxynaphthoic acid.) gave inconstant results and did not equal salicylic acid. Active combinations were also found among the terpenes (pinene, eucalyptol, terpin hydrate and carvone). Sandalwood oil and cinnamon oil were of little importance.

Urine, Acetoacetic Acid in, Determination of. — Bela and — Ondrevich. (*Apoth. Zeit.*, 1912, **27**, 591.) The determination is based on the equation:

$$CH_3{\cdot}CO{\cdot}CH_2{\cdot}COOH + I_2 = HI + CH_3{\cdot}CO\ CHI{\cdot}COOH$$

Five drops of $HC_2H_3O_2$, 50 per cent., are added to 5 c.c. of urine, then one drop of 1 : 500 solution of methylene blue, or sufficient to give a blue tint. The mixture is then titrated with N/10 I solution until a red tint appears. The presence of glucose, acetone, β-oxybutyric acid, glycerin lactic acid, bile, and α creatinine do not affect the result. The test may be used qualitatively, using tincture of iodine as the reagent. With this, 5 c.c. of urine acidified as above, should show a red tint after the addition of 3 or 4 drops, in the absence of aceto aceticacid.

Urine, Acetoacetic Acid in, New Test for. W. H. Hurtley. (*Lancet*, 1913, **184**, 1160.) To 10 c.c. of the urine add 2·5 c.c.

of strong HCl and 1 c.c. of a 1 : 100 solution of $NaNO_2$; shake and allow to stand 2 minutes. Now add 15 c.c. of strong AmOH, followed by 5 c.c. of a 10 per cent. solution of $FeSO_4$ or a solution of $FeCl_2$ of equivalent strength (2 Gm. of Fe in 100 c.c.). Shake up, pour into a 50 c.c. Nessler glass, and allow to stand undisturbed. It is not advisable to filter. A beautiful violet or purple colour is produced. The reaction is a slow one, and the speed at which the colour develops depends on the concentration of the acetoacetic acid in the urine; the colour deepens for several hours after its first appearance.

The test may be employed colorimetrically for approximately determining the amount of acetoacetic acid present. For this purpose a standard solution of sodium acetoacetate is prepared thus. Thirteen Gm. of chemically pure ethyl acetoacetate is treated with 100 c.c. of N/NaOH solution, and made up to 500 c.c. and set aside for 45 hours. From this a solution is made containing an amount of sodium acetoacetate equivalent to 1 Gm. of acetoacetic acid in 1,000 c.c. From this, by dilution, solutions containing the equivalent of 0·025, 0·02, 0·15, 0·01 Gm. of acetoacetic acid in 100 c.c. are prepared. The test is now performed according to the prescription given on 10 c.c. of each of these four and on 10 c.c. of the urine. If the colour develops much more quickly in the urine than in the 0·025 solution, the urine must be diluted ten or twenty times, and the test repeated on the diluted urine. In 4 or 5 hours the colours will be well developed and the initially turbid liquids will have become quite clear, the urine can be placed in its position among the standards, and so the percentage of acetoacetic acid is determined with fair accuracy. Should the urine develop the colour more rapidly than the diluted standard the former must be diluted to ten or twenty times its volume with water, and fresh tests performed with the diluted urine. Acetone does not give this colour reaction.

Urine, Albuminous, Notes on 5,488 Cases of. Guillaumin. (*Répertoire*, 1913, **25,** 157.) Of the 5,488 cases of albuminous urine with which the author has had to deal, 2,101 contained albumin in quantities too small for accurate determination; 1,739 gave from 0·01 to 0·25 Gm. per litre; 1,101, from 0·25 Gm. to 1 Gm. per litre; 162, from 1 Gm. to 5 Gm.; and 66, more than 5 Gm. One case of fatty degeneration of the kidneys gave no less than 60·3 Gm. per litre or 105·2 Gm. of albumin

was excreted in 24 hours. Rarely urines containing chyle and nucleoalbumin were met with, and one case of Bence Jones' thermosoluble form occurred. The pseudo-albumin of Moerner was found in 75 per cent. of the cases examined, but always in minute traces. These urines give a cloudy zone with syrupy solution of citric acid, and also one below the zone of contact with HNO_3. In these it is sometimes difficult to detect definitely the presence of true albumin. Hellers' reaction is not very delicate and will not detect albumin unless a few Gm. per litre are present. Coagulation on heating, without addition of acetic acid will be available in a naturally acid urine, but precipitation of phosphates may interfere. However, the presence of granular cylindrical casts may be detected microscopically in the presence of barely detectable traces of albumin, and these are always of important pathological significance. The importance of a careful microscopical examination of the deposit, however slight this may be, cannot be over-estimated; frequently this will reveal the presence of cylindrical casts or of pus. Cylinders were found in 1,377 of the above 5,488 cases dealt with and pus in 399. Of the 2,101 urines which contained minute traces of albumin, 288 contained cylinders, and 28 pus. Of the 1,739 samples with 0·01 Gm. to 0·25 Gm. of albumin per litre, 420 gave cylinders, and 106 pus. Of the 1,101 urines with 0·25 to 1 Gm. of albumin per litre, 420 showed cylinders and 134 pus. Among the 462 urines containing 1 to 5 Gm. of albumin per litre, 246 had cylinders, and 86 pus. In the 85 samples with 5 Gm. and more albumin per litre, 62 had cylinders and 4 pus.

Urine and Blood, Detection of Biliary Pigments in. — Pakuscher and Gutmann. (*Med. Klin.*, 1913, 837; *Apoth. Zeit.*, 1913, **28**, 414.) Five c.c. of the urine is treated in a test tube with 1 c.c. of 1 : 200 solution I in Et_2O. After shaking up and separating. In presence of bile pigments the lower aqueous layer will be green or greenish blue. This aqueous portion is then further washed with fresh ether, to remove excess of I, until the Et_2O is no longer coloured. The green tint of the aqueous liquid is then very evident if bile is present.

In the case of blood, 2 c.c. of serum is shaken with 3 c.c. of absolute alcohol and filtered. To the filtrate 0·3 to 0·5 c.c. of 25 per cent. HCl, and 2 c.c. of distilled water are added. This is shaken with 0·5 c.c. 1 : 200 I solution in Et_2O as above.

Urine, Chondroituria Simulating Albuminuria. H. Politzer.

(*Apoth. Zeit.*, 1912, **27,** 688.) In a considerable number of perfectly normal urines, a slight turbidity is obtained on adding acetic acid. This is due, according to Moerner, to the presence of chondroitic acid. It is found in true albuminuria, but it also occurs in the urine of the so-called albuminuria of puberty, of young soldiers and athletes after physical exertion, and in albuminuria from chill. It occurs sometimes also in urines which contain no albumin. If a trace of serum albumin be added to such urines, acidified by acetic acid, the characteristic turbidity will be obtained.

Urine, Colorimetric Determination of Uric Acid in. R. Riegler. (*L'Union Pharm.*, 1913, **54,** 236.) Three graduated 10 c.c. tubes are used. In one is placed 1 c.c. of 1 : 1,000 solution of uric acid ; in the second, 1 c.c. of the urine to be tested ; and in the third 1·22 c.c. of the same urine, from which the uric acid has been precipitated with AmCl. To each tube 2 c.c. of acid phosphomolybdic reagent 1 : 50 is added : and each is made up to 10 c.c. with Na_2HPO_4 solution. The mixture is then boiled until bubbles of gas no longer appear. The tubes are then plunged in cold water and the blue tint developed compared colorimetrically with that of the uric acid tube as a standard.

Urine, Convenient Method for Determination of Albumin in. F. R. Eldred and C. M. Pence. (*J. Amer. Pharm. Assoc.*, 1913, **2,** 154.) Filter the urine if cloudy and measure exactly 1 c.c. into a graduated tube having an internal diameter of 9 m.m, Dissolve 0·04 Gm. of Na_2HPO_4 in the urine and fill to the 4 c.c. mark with a mixture of acetone, 98 vols., and glacial acetic acid, 2 vols. Cork the tube, invert several times, then shake for 30 seconds. Allow to stand in a vertical position for exactly 15 minutes, then read off the volume of the precipitate. The amount of precipitate in c.c. is equivalent to the following percentages of albumin : 0·2 c.c. = 0·09 ; 0·25 c.c. = 0·13 ; 0·3 c.c. = 0·17 ; 0·35 c.c. = 0·22 ; .0·4 c.c. = 0·29 ; 0·45 c.c. = 0·37 ; 0·5 c.c. = 0·45 ; 0·55 c.c. = 0·54 ; 0·6 c.c. = 0·64 ; 0·65 c.c = 0·73 ; 0·7 c.c. = 0·82 ; 0·75 c.c. = 0·91 ; 0·8 c.c. = 1·01 ; 0·85 c.c. = 1·10 ; 0·9 c.c. = 1·19 ; 0·95 c.c. = 1·29 ; 1·0 c.c. = 1·38 ; 1·05 c.c. = 1·48 ; 1·10 c.c. = 1·59 ; 1·15 c.c. = 1·72 ; 1·20 c.c. = 1·86 ; 1·25 c.c. = 2·05. If the amount of precipitate exceeds 1·25 c.c. the urine must be diluted with an equal

volume of water and the percentage of albumin must then be multiplied by two.

Urine, Detection of Blood in. de Jager. (*Zentralb. f. Therap.*; *Pharm. Zentralh.*, 1913, **54,** 618.) Ten c.c. of the urine is treated with 1 c.c. of a mixture of HCl 2 and formalin 1. The precipitate is filtered out and washed once with water. For very weak urine less formalin should be used. The precipitate spread over the filter paper is moistened, by means of a glass rod, with a freshly prepared reagent, consisting of 12 drops of saturated solution of benzidine in glacial acetic acid and 2 c.c. of H_2O_2. In presence of blood blue spots will be seen in the precipitate. The test will easily detect 1 : 30,000. The test may be applied for detecting blood in other liquids, by first dlssolving 2 per cent. of ureatherein. Solid substances and bloodstains may be treated with 5 per cent HCl; to the liquid thus obtained 2 per cent. of urea may be added and 2·5 per cent. of formalin.

Urine, Detection of Formaldehyde in. L. Esperance. (*Berl. Klin. Woch.*, 1912, 2372; *Pharm. Zentralh.*, 1913, **54,** 582.) To 10 c.c. of the urine, 3 drops of phenythydrazine hydrochloride solution 1 : 20, and 3 drops of 1 : 20 solution of sodium nitroprusside. On adding a few drops of saturated solution of KOH, without mixing, a deep red colour appears at the zone of contact in presence of formaldehyde, which changes to dark green and yellow. Normal urine gives a reddish tint which merely fades.

Urine, Detection of Acetone and of Diacetic Acid in. S. Bonnamour and A. Imbert. (*Presse Méd.; Nouveaux Remédes*, 1913, **30,** 236.) *Acetone.* To detect this a modification of Légal's reaction is employed. The reagent consists of glacial acetic acid, 10 Gm.; solution of sodium nitroprusside 1 : 10 10 c.c. This keeps indefinitely in a coloured bottle. Fifteen c.c. of the urine is treated with 20 drops of the reagent; after mixing, 20 drops of AmOH solution is floated on the surface. In presence of 1 : 2,000 of acetone, a violet disc appears at the zone of contact, the depth of colour varying with the amount of acetone present. Acetone has been thus detected in the urine of those not affected with diabetes; also in macerations of liver, and of the jejunum and duodenum of animals killed during active digestion. The presence of acetone in quantity may indicate acidosis; but of itself it is not an indication of the

imminence of coma, nor does it indicate the presence of diacetic acid.

Diacetic Acid. To detect this Gerhardt's reaction is employed. The urine is diluted with 4 vols. of water. To this solution of Fe_2Cl_6 (sp.gr. 1·26) deluted with 10 parts of water is added drop by drop. In the presence of 1 : 10,000 of diacetic acid a black violet cloudy precipitate will be obtained. Normal urine, even that containing acetone gives white turbidity. These two tests can be easily made at the bedside.

Urine, Detection of Br in. G. Denigés and L. Chelle. (*L'Union Pharm.*, 1913, **54,** 89.) The following is the reagent employed : H_2SO_4 5 c.c., is mixed with water 95 c.c., and the mixture is cooled. Ten c.c. of a 1 : 1,000 aqueous solution of fuchsine is slowly run in with agitation, and set aside until the colour disappears. The reagent thus obtained is permanent. With a trace of free Br it gives an intense red colour, soluble in $CHCl_3$. If bromides have been administered 1 c.c. of the urine is sufficient. For normal Br from 10 to 50 c.c. may be used, according as the diet has been more or less choline free. To the sample one-tenth of its volume of N/KOH is added, the mixture is evaporated to dryness, and the residue is ashed. This is then dissolved in 5 c.c. of water, filtered, rendered faintly acid with 4 drops of pure HCl, then with 1 c.c. of pure H_2SO_4. As soon as the gas evolved is driven off 1 c.c. of the reagent, 0·2 c.c. of 1 : 10 K_2CrO_4 solution, and 1 c.c. of $CHCl_3$ are added ; the tube is closed and the contents strongly shaken for 30 seconds. In presence of 0·00001 Gm. of Br a red violet colour will be obtained. If I is suspected as well as Br, its presence may be shown by the direct addition of $NaNO_3$ in an acid solution and shaking out with $CHCl_3$. In this case, the coloured $CHCl_3$ of the Br test may be shaken with a few drops of $NaHSO_3$ solution. The colour due to an I-compound is discharged, but not that of Br-compound. The method is capable of colorimetric application.

Urine, Determination of Uric Acid in. A. Stephan. (*Apoth. Zeit.*, 1912, **27,** 817.) The acidity of 10 c.c. of the bulked urine excreted during 24 hours is first determined by titration with N/10 NaOH solution. Then 100 c.c. is taken and neutralized with the equivalent quantity of N/NaOH solution. To this neutral urine, in a beaker, 30 Gm. of AmCl is added. After thorough stirring, the mixture is set aside for 6 hours. The precipitate is then collected on a filter and the beaker is washed out with some

of the filtrate, so as to transfer all the precipitate to the filter. After draining, the filter is perforated and the precipitate is washed through with water into a porcelain capsule: 2 c.c. of HCl is added, and the volume of the liquid is reduced to 15–20 c.c., if necessary, by evaporation. After standing for 4 hours, the separated uric acid is collected on a tared filter, washed free from Cl with water, the volume of the filtrate being noted. It is then washed with EtOH, Et_2O and dried at 105–116°C. before weighing. To the weight obtained 1 Mg. is added for each 15 c.c. of the above aqueous washing measured.

Urine, Determination of Hippuric Acid in. T. Hryntschak. (*Biochem. Zeits.*, 1912, **43,** 315; *J. Pharm. Chim.*, 1913, **7,** 313.) One hundred c.c. of the urine is treated with NaOH, 10 Gm., and boiled in a Kjeldahl flask for $2\frac{1}{2}$ hours under a reflux condenser. Then $KMnO_4$, 10 Gm., is added in small portions, and heating gently continued for 5 to 7 minutes. The liquid should remain at least pink. After cooling small pieces of ice are added, then $NaHSO_3$, 15 Gm. Still keeping the liquid cool, H_2SO_4 1 : 2 is added to an acid reaction. The liquid is then shaken out five times with Et_2O. The residue, after distilling off the Et_2O is taken up with $CHCl_3$. This dissolves the benzoic acid which results from the decomposition of the hippuric acid. The $CHCl_3$ is driven off and the residual benzoic acid is weighed. The weight multiplied by 1·468 equals the amount of hippuric acid present.

Urine, Diabetic, Detection of Glyconuric Acid in. A. Jolles. (*Zeits. Physiolog. Chem. Oct.*, 1912; *Répertoire*, 1913, **25,** 178.) It is not easy to detect glyconuric acid in diabetic urine, because of the sugar. From 200 to 400 c.c. of the urine is treated with neutral lead acetate as long as a precipitate forms. The precipitate is washed three or four times by decantation, with 400 Gm. of distilled water each time. The bulked decanted liquid and washings are then precipitated with basic lead acetate. The precipitate is washed as before. The two precipitates are mixed, suspended in water and the Pb is precipitated as PbS. After filtering out this, the liquid is concentrated 20 c.c. When cold 5 c.c. of the residue is tested for glyconuric acid by Tollens's naphthoresorcinol reaction.

Urine, Diabetic, Detection of Pentoses in. Adolf Jolles. (*Zentr. inn. Med.*, 33, 693; *Chem. Abs. Amer. Chem. Soc.*, 1913, **7,**

97.) Four Gm. of phenylhydrazine-HCl, and 8 Gm. of $NaC_2H_3O_2$ are added to 100 c.c. of urine, which is then heated for 1 hour on the water bath, cooled well, and filtered. The precipitate is then added to 15 c.c. of hot H_2O in a beaker, heated for 5 minutes on the bath, and filtered. After adding 6 c.c. of HCl (sp. gr. 1·19) to the filtrate, it is distilled. Three c.c. of the distillate, together with 5 c.c. of Bial's reagent (1 Gm. orcinol in 500 c.c. of 30 per cent. HCl, to which 30 drops of ferric chloride solution is added), is heated for a short time. The presence of 0·05 per cent. pentose will be shown by a green colour. If the urine contains more than 5 per cent. of dextrose, 8 Gm. of phenylhydrazine-HCl, and 16 Gm. of $NaC_2H_3O_2$ must be added.

Urine, Differential Staining for Organized Sediments in. — Schott. (*Apoth. Zeit.*, 1912, **27,** 93.) Two solutions are used : (1) 5 per cent. aniline blue in water. (2) 2·5 per cent. eosin in glycerin with 5 per cent. of phenol. To 10 c.c. of urine in the centrifuge tube add one drop of No. 1 and 6 to 8 drops of No. 2 ; centrifuge and examine the precipitate. The different elements in the deposit will vary in colour.

Urine, Fleig's Reagent for Blood in, and for Testing the Renal Function in Senile Pneumonia. — Étienne and — Perrin. (*Prog. Med. ; Répertoire*, 1913, **25,** 127.) Fleig's reaction for blood depends on the oxidizing properties of haemoglobin and H_2O_2 on fluorescin. The fluorescin reagent is prepared by dissolving 0·25 to 0·50 Gm. of fluorescein in 100 c.c. 20 per cent. KOH solution. To this 10 Gm. of Zn dust is added. On heating the nascent H reduces the intensely fluorescent fluorescein to the colourless, non-fluorescent fluorescin. The reagent is kept in well stoppered amber glass bottles, in the dark. If it shows signs of fluorescence, the Zn must be shaken up and allowed to deposit. The fluorescence will then disappear. To detect blood, 2 c.c. of urine is treated with 0·25 to 1 c.c. of the reagent and 3 drops of H_2O_2, 12 volumes ; if it is present a distinct fluorescence will be evident at once. The authors consider Fleig's test to be specific for blood except in the presence of pus. Purulent urine must be boiled to destroy the leucocytic peroxydases, before applying the blood test. Care must be taken that the lip of the reagent bottle is carefully wiped each time before using, or a positive result may be obtained from a trace of fluorescein formed thereon by atmospheric oxidation. The albuminuria which frequently accompanies senile pneumonia

is due to two causes: to an epithetial lesion and to congestion resulting in extravasation of blood corpuscles. Often these occur simultaneously. If only the epithelium is at fault, there will be no blood reaction by the above test of Fleig but only a positive albumin reaction. If there is a reaction for both blood and albumin both renal congestion and epithelial lesion are present. (See also *Y.B.*, **1907,** 26; **1908,** 202; **1910,** 52; **1911,** 52; **1912,** 533.)

Urine, Methods for Determining Uric Acid in. L. Bernard. (*Bull. Sci. Pharm.*, 1913, **20,** 66.) After experimental criticism of the published processes the author concludes that gravimetric determination of the acid liberated from the silver compound is the only satisfactory method. For this purpose, the process of Salkowski is to be preferred to all others. Volumetric silver methods are inaccurate: those with Cu are no better; precipitation with AmOH is doubly incorrect, and all precipitation methods are unsatisfactory. Salkowski's method consists in precipitating the acid and purins with ammoniacal $AgNO_3$ in presence of magnesium mixture and an excess of AmOH. The precipitate, after washing with dilute AmOH is decomposed by H_2S. The Ag_2S is removed, and the filtrate evaporated to a small volume is acidified with HCl. The uric acid then crystallizes out, and is weighed, as such. All other methods are condemned.

Urine, Method of Sampling for Micro-examination. G. H. Meeker. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 859.) Shake the sample which, if possible, should be the excretion of 24 hours, so as to make it homogeneous. Take two conical centrifuge tubes, each having a capacity of about 20 c.c. Label the tubes "a" and "b." Into each tube put about 15 c.c. urine. With the contents of "b" mix one drop of a 1 per cent. solution of ammonia-alum, followed by a drop or two of AmOH water, if necessary, to produce a faint alkalinity. Now rotate both tubes until sedimentation appears to be complete. Remove the tubes from the centrifuge and pour off the clear liquid. Next introduce a small, pointed micro-pipette into the sediment, and blow gently through the sediment. Using the pipette, transfer a drop of the turbid material to a slide. Again mix the sediment by blowing through the pipette and again prepare a slide. There are now four slides—two from "a" and two from "b." To "a" now add one drop of any staining

fluid desired, and to "b" add a drop or two of an acidified staining liquid, or enough to dissolve the earthy phosphates and aluminum hydroxide present. Having allowed sufficient time for the staining action, prepare four more slides as described above. A cursory examination of the eight slides with the $\frac{2}{3}$ in. objective and a more detailed examination of one or two of the slides under the $\frac{1}{8}$ in. objective may then be made.

The use of the alum in alkaline solution ensures the formation of a coagulum which entangles and precipitates all morphologic elements of the urine and checks the findings in test tube "a." The sediment must be mixed before taking the drop upon the slide because the solids do not settle uniformly.

Urine, Modified Jolles' Test for Albumin in. A. Jolles. (*Med. Press*, 1913, **95,** 233.) The reagent is composed of $HgCl_2$, 10; citric acid, 20; NaCl, 20; distilled water, 500. Three test tubes, numbered 1, 2 and 3 are taken, and 5 c.c. of the urine is introduced into each. To No. 1 and No. 2 1 c.c. of dilute acetic acid is added and to No. 1 only, 5 c.c. of the above albumin reagent. Tubes No. 2 and No. 3 are then diluted with distilled water to the same volume as No. 1. They are now examined against a dark background, when albumin, if present to the extent of 1 : 120,000, will show a lighter colour of the reflected light. If pus be present No. 1 will be more cloudy than No. 2. In the presence of mucin or nucleo-albumin No. 3 will show a turbidity, which will disappear on diluting with water if nucleo-albumin is the cause. The urine should be made faintly acid with HNO_3 before applying the test. Iodine, if present, will give a precipitate with the reagent, which is, however, soluble in excess, and in EtOH.

Urine, Modified Nitric Acid Test for Albumin in. F. Michel. (*Chem. Zeit.*, 1911, 183; *Pharm. Zentralh.*, 1912, **53,** 1195.) Nitric acid, sp. gr. 1·4, saturated with $AmNO_3$ is the reagent employed. The urine is floated on the dense reagent. The ring test is thus rendered sharper and more definite. On mixing a turbidity occurs which may disappear on warming, and a slight yellow colour is formed. When a considerable amount of albumin is present the turbidity reappears on cooling. (See also *Y.B.*, **1910,** 54; **1912,** 63.)

Urine, New Method for the Colourimetric Determination of Uric Acid in. O. Folin and A. B. Macallum, Jr. (*J.*

Biol. Chem., **13,** 363; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 621.) To 2 to 5 c.c. of urine add a drop of a saturated solution of $H_2C_2O_4$ and evaporate to dryness. After cooling, add 10 to 15 c.c. of a mixture of two parts of anhydrous Et_2O and one part pure MeOH. After 5 minutes decant the liquid and again extract the residue with 10 c.c. of the alcohol-ether mixture. This extracts the phenol acids which would later give a colour similar to that produced by uric acid. To the residue add from 5 to 10 c.c. H_2O and a drop of a saturated solution of Na_2CO_3. When completely dissolved add 2 c.c. of a reagent prepared by boiling 100 Gm. Na tungstate with 80 c.c. 85 per cent H_3PO_4 and 750 c.c. H_2O for about two hours and diluting to 1,000 c.c. and 20 c.c. of saturated Na_2CO_3 solution and transfer to a 100 c.c. flask. Dilute to the mark, and compare the colour in a Dubosq colourimeter with that obtained by treating a solution of 1 Mg. of uric acid in Li_2CO_3 with the reagent. The standard solution is prepared by dissolving 250 Mg. of uric acid in 25 c.c. of 0·4 per cent. Li_2CO_3 solution and 25 or 50 c.c. of H_2O, then diluting to 250 c.c. This keeps about a week. Another standard may be prepared by dissolving a few Mg. of uric acid in 20 c.c. saturated $NaCO_3$ solution in a 100 c.c. flask, adding 1 c.c. of the reagent and diluting to 100 c.c. The colour is compared with that obtained with the first standard. Thereafter 1 c.c. of the reagent treated with an excess of uric acid will give the same colour and may be used as a standard. This must be freshly prepared for each determination.

Urine, Variations in the Nature of the Albuminous Constituents of. G. Patein and E. Roux. (*J. Pharm. Chim.*, 1912, **6,** 62.) It is well known that the so called albumin of morbid urine is a complex, composed of serin and globulin. It is not so well known that the relative proportion of these to each other varies under different pathological conditions, and that the determination of the amounts of each may be of considerable diagnostic value. To determine the *total albumin*, the authors employ the following gravimetric process. A volume of urine, approximately equivalent to 0·3 Gm. of albumin, as shown by a preliminary test, is taken and if of high sp. gr., diluted with water. To each 100 c.c. 5 or 6 drops of acetic acid and 20 Gm. of Na_2SO_4, $10H_2O$, heat to boiling and collect the precipitate on a tared filter. Wash the precipitate, first with hot water, then with EtOH, and finally with Et_2O; drain well,

and press between filter paper and dry at 100° C. until constant, then weigh as total albumin.

To determine the *serin*, a similar volume of urine is taken, made neutral, or even alkaline with Na_2CO_3, and treated with 90 Gm. of $MgSO_4$, $7H_2O$. A note is made of the increase of volume which will be 148 c.c. for each 100 c.c. of urine taken. After filtration, one and a half times its volume of water is added to the filtrate, then 8 drops of acetic acid for every 100 c.c., and the mixture is boiled. After allowing the precipitate to settle for 24 hours, the supernatant liquid is decanted, and the precipitate, collected on a tared filter, is treated as described for albumin, and weighed, when dry, as serin. The difference between the weight of serin and of total albumin gives the amount of *globulin*. As a rule in chronic albuminuria the ratio of serin to globulin remains fairly constant in a given case whose condition is stationary or whose regimen is regularly followed. In cases of simple nephritic albuminaria, hydropigenous nephritis and hypertensive nephritis the amount of globulin is small; not exceeding 10 to 15 per cent. of the total albumin. If an increase of the globulin appears, it denotes renal congestion. In cases of hydruric nephritis the ratio between globulin and serin appears to be less constant. Sometimes the globulin equals or even exceeds the amount of serin present. It is in such urines that modifications of the coagulability of the albumin occur. No coagulation at all may be obtained unless the amount of acetic acid added be very small. The amount of chlorides present does not seem to affect this coagulability in any way.

Urobilin, Determination by Means of $CuSO_4$. T. Hausmann. (*Deut. Med. Wochschr.*, **39,** 360; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 1729.) To 10 to 20 c.c. of urine is added 20 to 40 drops of 10 per cent. $CuSO_4$, shaken, 2 to 4 c.c. $CHCl_3$ added and carefully run back and forth without shaking. If urobilin is present the $CHCl_3$ becomes pale or dark yellow (in alkaline urine it is red). Examined spectroscopically the $CHCl_3$ gives the characteristic urobilin absorption bands (between the green and blue). The entire urobilin is not extracted from the urine by $CHCl_3$ but the urine itself still gives the spectroscopic bands. The addition of HCl increases the extraction by $CHCl_3$. The copper salt changes urobilinogen to urobilin, but a Cu urobilin salt is not formed. For quantitative clinical estimations the author recommends diluting the $CuSO_4$ treated urine with H_2O

until the spectroscopic bands are no longer visible (the highest concentration observed required a dilution of 40 times to disappearance of the bands.) A graduated tube for clinical determination for urobilin is described. This method is not identical with that described by Salkowski, who obtained a biuret reaction from urobilinogen solutions treated with alkali and a few drops of $CuSO_4$ solution.

COLOURING MATTERS

Anthokyan and Anthoxanthin, Blue and Yellow Pigments of Flowers. Damm. (*Naturwiss. Woch.*, 1912 [49], 769; *Schweiz. Woch. Chem. Pharm.*, 1913, **51,** 119.) The author classes a group of blue pigments under the name of *Anthokyan.* These are generally dissolved in the cell sap. If this is acid, they are red; if alkaline, blue. An excess of alkali and the presence of tannins cause a green shade. They also occur in the cell contents of flowers in a solid form, both amorphous and crystalline. These result from the supersaturation of the sap with the colouring matter. The crystals are very hygroscopic and easily rendered amorphous. They melt at 270°C. and have the formula $C_{18}H_{26}O_{13}$, and act as a tribasic acid. They give a deep red colour with acids, and a greenish red with alkali. The amorphous anthokyan has similar reactions. It is a glucoside, $C_{24}H_{44}O_{20}$, and liberates dextrose on hydrolysis. It is a decomposition product of the crystalline substance. *Anthoxanthin* is the yellow colouring-matter of flowers. It is generally combined with chromatophores which occur in the protoplasm of the cells, like chlorophyll. It rarely occurs dissolved in the cell sap. Its chemical constitution is unknown.

Caramel, Detection of, in Vinegar. L. Ronnet. (*Annales des Falsificat.*, 1912, **5,** 517.) Fifty c.c. of the vinegar is treated with an excess of $CaCO_3$ and evaporated to dryness on the water bath. The powdered residue is then triturated with Et_2O and filtered on to 10 c.c. of a 1 : 100 solution of resorcinol in HCl sp. gr. 1·125. In presence of caramel a permanent bluish red or violet ring appears at the zone of contact.

Cedrella Toona, the Colouring Matter of the Flowers of. A. G. Perkin. (*Proc. Chem. Soc.*, **28,** 198.) The Toona is a large Indian mahogany tree. The flowers which constitute one of the natural Indian dye-stuffs are reputed to yield a red and

yellow dye (known as gunari) which is applied without mordants. The flowers were extracted with 5 parts boiling water for 6 hours, the extract filtered and the residue well pressed. This extract was treated with 33 per cent. HCl and heated at 70–80° for 6 hours. The liquid was decanted, the deposit collected and dried. This was then extracted with absolute EtOH. A red powder was obtained. From pyridine this substance separates in large orange plates or leaflets. Nycanthin from *Nycanthes arbor tristis*, is identical with the colouring matter of the Toona.

Colours, "Aniline," Detection of, in Wine and Syrup. P. Malvezin. (*Annales Chim. Analyt.*, 1913, **18,** 193.) The reagent employed is methanal sulphurous acid CH_2OH, SO_3H, easily obtained by saturating commercial formaldehyde solution, 40 : 100, with SO_2. This gives a violet colour with fuchsine even after it has been decolourized with SO_2 or animal charcoal. To detect aniline colour in wine, this is decolourized with animal charcoal, care being taken not to use a great excess of the latter. Two c.c. of the filtrate is mixed with an equal volume of the reagent. In presence of fuchsine a violet tint is slowly developed. If only a trace is present the reaction is sensitized by rapidly heating the mixture to boiling. In the absence of aniline colour a pink tint is given with red wines.

Coloured Liquids, International Standards for, and a Suggested Method of Standardization. Dr. H. V. Arny. (*Internat. Cong. Applied Chem.; Chem. and Drugg.*, 1912, **81,** 514.) The author suggests the use of half-normal slightly acidulated solutions of $CoCl_2$ (red), Fe_2Cl_6 (yellow), and $CuSO_4$ (blue). Starting with the possible combination of three colours that would make 12 c.c., he has prepared a set of eighty-eight blends, the tints of which are tabulated (and shown in a graded series of solutions) and range from the pink of cobalt solution to the blue of $CuSO_4$. To give two examples of the method of preparation of the standard tints: The deepest standard shade in the yellow group is composed of 5 red, 5 yellow, 2 blue = 12. The lightest standard shade in the yellow group is composed of 1 red, 11 yellow, 0 blue = 12. The deepest standard shade in the blue-green group is composed of 0 red, 4 yellow, 8 blue = 12. The lightest standard shade in the blue-green group is composed of 0 red, 1 yellow, 11 blue = 12. A system was suggested of colour-nomenclature based on the above proportions of half-normal red, yellow, and blue solutions employed to make the tints.

Colours, Mixed, Detection of, in a Compound Dye. M. Frenkel. (*Ann. Chim. Analyt.*, 1913, **18,** 58.) A piece of filter-paper, 5 cm. square, is sprinkled with a minute quantity of the colour; while the paper is held horizontally a small drop of distilled water is allowed to fall on it, and by its side a drop of EtOH. In spreading out on the paper, the drops produce regular spots in which are distinguished clearly the colour which constitute the mixture. On the back of the spot, produced by the solvent after the paper has been dried, the tints of the soluble components are observed very distinctly.

Cudbear as a Colour in Pharmacy. G. M. Beringer. (*Amer. J. Pharm*, 1912, **84,** 352.) In order to facilitate percolation it is recommended to mix the washed and dried cudbear with one half its weight of powdered clean cork in No. 20 to No. 40 powder. The best result is obtained by first mixing the cudbear powder, 125 Gm. with 25 c.c. of HCl, to neutralize the alkali, and drying. The dry product is then mixed with the cork, and percolated with alcohol 90 per cent. to 1,000 c.c. The preparation thus obtained keeps perfectly. In this respect it is superior to an ammoniacal preparation. An ammoniacal solution of high tinctured power may be obtained by percolating the powdered cudbear, 125 Gm. mixed with cork, as above, with a menstruum of solution of ammonia 1 vol., water, 3 vols., until 4,000 c.c. has been collected. This is evaporated to 750 c.c. and when cold, 250 c.c. of alcohol is added. This preparation is of high tinctorial power. It may be reduced to an arbitrary colour standard if desired.

Cudbear Extract, Uniform. H. V. Arny. (*J. Amer. Pharm. Assoc.*, 1913, **2,** 47.) Uniform cudbear extracts have been prepared by percolating the drug, first with $CHCl_3$ to remove the brown pigment, and then with acetone; the acetone percolate being distilled and the thin extract thus obtained dried by "scaling." This extract is soluble in water containing ammonia and in alcohol, and a faintly ammoniacal alcoholic tincture is freely miscible with water. The tinctorial power is approximately three times that of a direct acetone extract and about 300 times that of an average sample of tincture of cudbear, N.F. Six samples of these extracts in a dilution of 1 to 40,000 were practically identical in tint and in intensity.

Cudbear, the Red Colouring Principle of. A. Gardner.

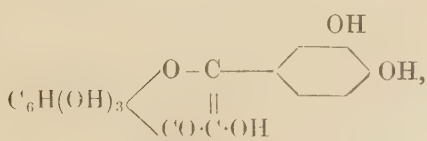
(*J. Amer. Pharm. Assoc.*, 1913, **2**, 51.) The cudbear is packed firmly in a percolator and percolated with petroleum ether until entirely free from wax (which requires about 2,500 c.c. to 1,000 Gm. of drug) after which the drug is dried.

It is then repacked and percolated with acetone (which will require 2,500 c.c. acetone for thorough exhaustion). The acetone is then distilled off, and the residue, placed in a porcelain capsule, is heated to 99°C., for 30 minutes. The mass is then powdered and placed in a desiccator for three days, during which time it will lose about 25 per cent. of its weight. This product is named persionin.

Persionin is a black lustrous powder with an aromatic odour, soluble in EtOH, glycerine, $CHCl_3$, Et_2O, and hydroalcoholic liquids, but is only sparingly soluble in water.

The yield from five samples of cudbear ranged from 5 to 7 per cent. The tinctorial value of the product from all was identical.

Gossypetin. A. G. Perkin. (*Proc. Chem. Soc.*, 1913, **29**, 110.) Gossypetin, $C_{15}H_{10}O_8$, exists as glucoside in the ordinary Indian cotton flower, *Gossypium herbaceum*, in conjunction with quercetin. With alcoholic *p*-benzoquinone, or by alkaline oxidation, gossypetin gives *gossypitone*, $C_{15}H_8O_8$, dull red microscopic needles, soluble in dilute alkali with a blue colour, and this reaction also occurs during the dyeing operation when mordanted wool is employed. Gossypitone is a quinone, and with SO_2 is re-converted into gossypetin, but is not identical with the quercetone described by Nierenstein and Wheldale. Whether gossypitone is to be regarded as an "anthocyanin" and indirectly responsible for the red of the cotton petal (such as that of *G. arboreum*), is uncertain, although a reddish violet crystalline compound can be obtained from the gossypetin glucoside. To gossypetin the constitution of an hexahydroxyflavone isomeric with myricetin and quercetagetin is assigned—



but as in the case of the latter colouring matter the position

of the hydroxyls in the tetrahydroxybenzene nucleus remains undecided.

Hair Dyes, Detection of Colouring Ingredients in. Cerbeland. (*Boll. Chim. Farm.*, 1912, **51,** 300; *Pharm. Zentralh.*, 1913, **54,** 455.) To 5 c.c. of the dye, 5 drops of solution of chlorinated potash and 1 drop of 1 : 10 HCl are added. In presence of paraphenylene-diamine an emerald green colour will be obtained; with diaminophenol, a raspberry red; with pyrogallol, yellowish brown; with gallic acid, dark red to black; with henna, the tint is not markedly altered. If to 5 c.c. of the dye 0·2 Gm. of $NaNO_2$ and HCl are added, the following colour reactions will be obtained: With paraphenylenediamine, a bright yellow becoming paler with excess of HCl; with diaminophenol, yellowish brown, not altered by excess of HCl; with pyrogallol, orange yellow; with gallic acid, pale yellow; with henna no marked change in colour. Fe_2Cl_6 colours henna preparations emerald green, changing to violet and finally to dark green. Paraphenylenediamine alone may be identified by the sky blue colour it gives when mixed with raw milk and H_2O_2. (See also *Y.B.*, **1907,** 120, 197.)

Juglone, Micro-detection of. O. Tunmann. (*Pharm. Zentralh.*, 1912, **53,** 1,005.) If sections of green walnut pericarps are immersed in aqueous solution of Cu $2C_2H_3O_2$ and mounted in chloral hydrate, characteristic crystals of a definite Cu-juglone compound are obtained in rosette groups which polarize light, and are specially evident when examined with the selenite plate. Juglone may also be obtained from the same material by micro-sublimation. If the material is only one or two days old, juglone sublimes at once, and crystals form on the cover-glass as soon as moisture condenses. If it is older the juglone sublimate does not form so quickly, requiring some minutes to appear. Juglone appears to be formed by the oxidation of α-hydrojuglone in the tissue cells. The communication is illustrated.

Pansy Colouring Matter as a Chemical Indicator. E. Pozzi Escot. (*Annales Chim. Analyt.*, 1913, **18,** 58.) The colouring matter of the so-called black pansies (tufted violas) frequent in gardens is a deep blue colour readily soluble in water and in alcohol. This has intense tinctorial power and is very sensi-

tive to fixed alkalies and ammonia, which change it to green. Mineral acids give a red colour; with weak organic the colour is unaffected. It is suggested that a tincture of the flowers would serve as a useful chemical indicator in alkalimetry. (Pharmacists are familiar with this colour in *Syrupus violae*. ED., *Y.B.*)

ESSENTIAL OILS

Abies Pectinata Seeds, Oil of. (*Schimmels' Report*, Oct., 1912, 94.) The crushed seeds yielded from 12 to 13 per cent. of oil. Sp. gr. 0·8629 to 0·8668; α_D −68°14′ to −76°38′; μ_{D20} 1·47636 to 1·47812; acid value 0·5 to 1,8; ester value 0·9 to 3·7; soluble 1 : 5 to 1 : 7 and more of EtOH 90 per cent.

Alpinia Alba, Oil of the Fruits of. S. S. Pickles and J. C. Earl. (*Proc. Chem. Soc.*, 1913, **29**, 164.) A small quantity of the fruits of *Alpinia alba*, Rosc. (*Amomum medium*, Lour.) was received at the Imperial Institute from Hong Kong in 1911. The fruits, on examination, were found to contain a volatile oil, which occurred almost entirely in the seeds. On steam distillation, about 1 per cent. of a pale yellow oil, having an odour recalling lemon and eucalyptus, was obtained. Sp. gr. 0·9366, α_D −2°15′. The oil, of which only 70 c.c. were available, was shaken, first with dilute Na_2CO_3, next with $NaHSO_3$ solution, then with dilute NaOH, and finally with 50 per cent. resorcinol solution to absorb cineol. From the results of this treatment and the subsequent examination of the various products, the composition of the oil was found to be approximately as follows: *Cineol*, 69 per cent.; characterized by the crystalline additive product with iodol. *Aldehydes and ketones*, 27·5 per cent., consisting mainly of citral, which was characterized by means of the semicarbazones and the β-naphthacinchoninic acid. *Phenols*, 1·5 per cent. *Acids*, 1 per cent. A small quantity of a crystalline acid, m.p. 46–48°, was isolated, but not in sufficient quantity for identification. The residue, amounting to about 1 per cent., seemed from its odour to consist chiefly of terpenes.

Amomum Globosum Fruits, Oil of. (*Schimmels' Report*, April, 1913, 111.) Chinese wild cardamoms yielded 4 per cent. of a colourless oil, with the following characters: Sp. gr. 0·9455;

α_D + 43°54′, $\eta_{D20°}$ 1·47141 ; acid value, 0·8 ; ester value, 128·4 ; insoluble 1 : 10 in EtOH 70 per cent. ; soluble 1 : 1 in EtOH 80 per cent. The oil had a marked camphor like odour, but the amount available was insufficient for examination.

Angostura Bark, Oil of. (*Schimmels' Report*, April, 1913, 26.) The bark of *Galipea officinalis* yielded 1·03 per cent. of pale brown oil not completely soluble in EtOH, 90 per cent. ; sp. gr. 0·9285 ; α_D −7° 32′ $\eta_{D20°}$ 1·50744 ; acid value, 1·8 ; ester value, 5·5 ; acetyl value, 35·7. According to published statements the α_D of the oil is usually −36° to −50°.

Anise Oil. (*Evans' Analyt. Notes*, 1912, **7,** 8.) Two specimens of star anise oil not completely soluble in EtOH are reported on. These had the sp. gr. 0·9772 and 0·9775 ; η_D 1·5496 and 1·5498 ; α_D + 0°20′ and + 0·18′ ; m.p. 17°C. and 17·5°C. Two samples were apparently adulterated with fennel oil. These had the following characters : Sp. gr. 0·9733, 0·9737 ; η_D 1·5462, 1·5461 ; α_D + 3°, + 2°40′ m.p. 14°, 15° ; solubility in EtOH 90 per cent 1 : 4·3. These oils gave abnormal results on fractionation. One sample of a so-called " English " oil with a pale colour and sweet odour, somewhat more viscous than star anise, had : Sp. gr. 0·9826 ; η_D 1·5153 ; α_D + 3°15′ ; m.p. 9·5°C. (congeals 6°C.) ; solubility in alcohol, 90 per cent., 2 : 1.

Anise Oil, Adulterated with Petroleum. E. J. Parry. (*Ch m. and Drugg.*, 1912, **81,** 372.) Adulterated anise oil, having the following characters, has been offered in the London market : Sp. gr. at 20°C., 0·937 ; α_D − 0° 5′ ; $\eta_{D20°}$ 1·5230 ; Dispersion, 33·3 ; m.p., 9°C. ; Congealing-point, 7°C. On shaking the oil with four times its volume of 90 per cent. EtOH there separated 40 per cent. of oil, which, when again washed with alcohol and separated, had the following characters : Sp. gr. at 20°C., 0·885 ; α_D, 0° ; $\eta_{D20°}$, 1·4896 ; Dispersion, 37 ; m.p., — ; Congealing-point, not solid at −10°C. On saponifying this oil (traces only of KOH were used), it remained unaltered. This anise oil is clearly adulterated with about 40 per cent. of petroleum oil. Anise oil has lately been arriving in London with quite abnormal characters (August, 1912). The following figures represent two of such abnormal oils, together with a pure oil, all three having been shipped under the same brand :

	Abnormal (1).	Abnormal (2).	Pure.
Sp. gr. at 20° C.	0·979	0·977	0·9815
α_D	—1°	—0° 50′	—1°
M.p.	16·5° C.	16° C.	18·5 C.
Congealing-point	13·5 C.	13° C.	15° C.
$\eta_{D\ 20°}$	1·5505	1·5500	1·5548
Dispersion	30	30·2	29·5
Solubility in 90 per cent. EtOH	not in 4 vols.	not in 4 vols.	in 2–3 vols.
η_D of first 50 per cent.	1·5486	1·5482	1·5534
Do. of last 15 per cent.	1·5464	1·5463	1·5550

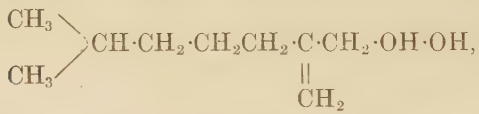
Atherosperma Moschata Leaves, Essential Oil of. Margaret E. Scott. (*J. Chem. Soc.*, 1912, **101,** 1612.) The fresh leaves yielded from 1·7 to 2·65 per cent. of pale yellow oil with a sassafras odour. Sp. gr. 1·027; α_D + 7·5°; η_D 1·5211. It contained methyl eugenol 50 to 60 per cent.; pinene 15 to 20 per cent.; camphor 15 to 20 per cent.; and safrol 5 to 10 per cent. *Atherosperma moschata* grows freely near Healesville and Warburton in Victoria. It is known as "Australian Sassafras."

Benzaldehyde, Determination of, in Oil of Bitter Almonds. F. D. Dodge. (*Orig. Com. 8th Internat. Cong. Appl. Chem.*, **17,** 15; *Chem. Abs. Amer. Chem. Soc.*, 1912, **6,** 3162.) The author has compared: (1) the U.S.P. process (Sadtler); (2) the iodometric (Ripper); (3) the hydrazone process (Denner); (4) the oxime process (Walther, Bennett); (5) a method based on Cannizzaro's reaction. The method utilizing Cannizzaro's reaction of benzaldehyde with strong alkali is based on the following equation: $2C_6H_5COH + KOH = C_6H_5COOK + C_6H_5CH_2OH$. With alcoholic KOH weaker than $N/_2$, the reaction was incomplete and uncertain, but with $N/_{2\cdot5}$ solution, good results were possible. In applying any of the assay methods for benzaldehyde to oil of bitter almonds the effect of the presence of HCN must be kept in mind. The U.S.P. limits of 4 per cent. HCN and 85 per cent. benzaldehyde are incompatible, the range of 2–4 per cent. HCN corresponding to a free aldehyde content of 80·3 to 90·1 per cent. (See also *Y.B.*, **1904,** 59; **1905,** 408; **1908,** 33; **1909,** 18.)

Borneo Camphor Oil. (*Schimmels' Report*, April, 1913, 32.) The dark brown oil with an odour of turpentine and borneol had the following characters: Sp. gr. 0·9189; α_D + 11°5′; $\eta_{D\,20°}$ 1,48847; soluble 1 : 5 of 90 per cent. alcohol with slight turbidity;

insoluble 1 : 10 of 80 per cent. alcohol ; acid value, 5·6 ; ester value 0, acetyl value 50·5. It contained about 35 per cent. of terpenes, consisting of *d*-*α*-pinene, camphene, *β*-pinene, and dipentene ; about 10 per cent. of alcoholic constituents, borneol and *α*-terpineol, about 20 per cent. of sesquiterpenes, and approximately 35 per cent. of resin.

Bupleurol, Constitution of. L. Francesconi and E. Seragiotto. (*Atti Real. Acad. del Lincei* [5] **22** (1), 148 ; *Chem. Zentralb.*, 1913, **1,** 1508.) Bupleurol is analogous in constitution to citronellol and androl, and is a primary alcohol $C_{10}H_{20}O$. Since the main constituent of the essential oil of *Bupleurum fruticosum* is *β*-phellandrene, probably this terpene is derived from bupleurol which would have the constitution



which is borne out by its chemical behaviour and physical properties. (See also *Y.B.*, **1912,** 76.)

Cajuput Oil, Sophisticated. (*Perfum. Record*, 1912, **3,** 248.) A parcel of cajuput oil with markedly "abnormal" characters has been offered on the London market. It had the sp. gr, 0·924 and gave only 54 per cent. of constituents distilling below 225°C. Genuine oil gave 84 per cent. It yielded only 14 per cent. of cineol by the H_3PO_4 method, whereas genuine cajuput gives not less than 60 per cent. The opinion is expressed that this is fractionated oil.

Camphor, Adulterated with Sucrose. E. Labbé. (*Bull. Sci. Pharm.*, 1913, **20,** 343.) In preparing spirit of camphor about 20 per cent. of a crystalline substance insoluble in alcohol was found. This proved to be sucrose.

Camphor, Production of, from Different Parts of the Tree. B. J. Eaton. (*Bullet. Agric., Federated Malay States ; Schimmels' Report*, 191, Oct., 1912, 28.) Details concerning the methods of distillation and the forms of stills used are given. The results obtained by the author show that the leaves are the best material to use, since they yield well and their removal does not injure the plant. The roots yielded 1·1 per cent. of oil with a camphoraceous lemon odour ; the leaves give 1 per

cent. and more of crude camphor. The results of a number of other workers are quoted to show that the leaves are the best material to use. (See also *Y.B.*, **1910,** 194; **1912**, 77.)

Camphor Oil, from the Federated Malay States. (*Bull. Mp. Inst.*, 1913, **11,** 46.) The pale yellow oil deposited 19·3 per cent. of camphor on being cooled to −10°C. The residual oil after removal of this camphor had the sp. gr. 0·913; α_D + 41°1′. It contained no safrol. The original oil was obtained by distilling the prunings of young trees. Crude camphor obtained from the same source resembled Chinese "leaf" camphor in characters.

Camphor Oil, Light, and Turpentine Oil, Distinction Between. — Utz. (*Pharm. Zentralh.*, 1913, **54,** 200.) If one 2 vols. of the oil is shaken in a separator with 1 vol. of $SnCl_2$ solution, Ph.G., V. turpentine oil appears pale yellow; after separating the reagent, this is yellow, and the separated oil colourless. Under similar treatment light camphor oil gives a blood red colour; after separation, the oil is orange tinted and the reagent blood red. Pine-wood oil gives a similar colour; but is distinguishable from light camphor oil by its behaviour with KOH.

Camphor Oil, New Constituents of. F. W. Semmler and J. Rosenberg. (*Berichte*, 1913, **46,** 768.) By submitting the high boiling blue fractions of camphor oil to re-fractionation under reduced pressure, several new constituents have been isolated. These are a new bicyclic sesquiterpene, *sesquicamphene*, $C_{15}H_{24}$, boiling at 129–133°C. under 8 mm.; a sesquiterpene alcohol, *sesquicamphenol*, $C_{15}H_{26}O$; a monocyclic diterpene $C_{20}H_{32}$ *α-camphorene*, and a bicyclic diterpene $C_{20}H_{32}$ *β-camphorene*. α-camphorine forms a crystalline tetrahydrochloride, but β-camphorene does not. Besides these limene and cadinene were detected.

Canada Balsam, Oil of. (*Southall's Report*, 1913, **21,** 26.) A specimen of this oil, distilled in Birmingham, gave the following results: Sp. gr., 0·862; α_D, −28·2°; Esters, nil.; η_D, 1·4767.

Cedar Wood Oil, New Constituents of. F. W. Semmler and E. W. Mayer. (*Berichte*, 1912, **45,** 786.) A new sesquiterpene alcohol, *cedrenol*, $C_{15}H_{24}O$ has been isolated from the oil. Cedrenol is optically inactive, boils at 165° to 169° C. under 9·5 mm.; sp. gr. 1·0083; η_D 1·5212. Another alcohol of the

same formula, $C_{15}H_{24}O$, *pseudo-cedrol*, is also present; this has the sp. gr. 0·9964; $\alpha_{D20°}$ + 21·5°; $\eta_{D20°}$ 1·5131.

Cherry Kernels, Volatile Oil of. (*Schimmels' Report*, April, 1913, 111.) Crushed cherry stones yielded 0·016 per cent. of an oil possessing the following characters: sp. gr. 1·0532; α_D + 0°; $\eta_{D20°}$ 1·53888; soluble 1 : 2·5 of 60 per cent. alcohol. The HCN content was 0·27 per cent. The oil was colourless to pale yellow and had an odour similar to that of bitter almond oil, although distinct therefrom.

Cineol, Determination of, in Essentials Oils by Means of $KMnO_4$. F. D. Dodge. (*J. Ind. Eng. Chem.*, 1912, **4**, 592.) Ten c.c. of the oil is run into a 500 c.c. flask having a narrow neck, and 5–6 per cent. $KMnO_4$ solution added in small portions, with shaking, keeping the flask in ice water, until the reagent is no longer reduced. The amount required will vary from 100 c.c. for rich oils to 400 c.c. for inferior ones. When an excess of $KMnO_4$ has been added, the flask is kept cold, with occasional shaking, for 12–18 hours. The precipitated MnO_2 is then dissolved by sufficient H_2SO_3 (or $NaHSO_3$ and HCl) and the flask filled with water, allowing the unoxidized oil to collect in the neck. After settling, the oil is transferred by a capillary pipette, to a graduated tube, washed with a little alkali to remove traces of H_2SO_3, and the volume read off.

Cineol in Eucalyptus Oil, Determination of, by Means of $KMnO_4$. C. T. Bennett. (*Perfum. Record*, 1912, **3**, 295.) Dodge in a communication to the International Congress of Applied Chemistry has proposed to determine the cineol in eucalyptus by destroying the terpenes with cold 5 per cent. $KMnO_4$ solution, and after 24 hours' contact, dissolving the MnO_2 with H_2SO_3 and measuring the volume of unoxidized eucalyptol. Working with the ordinary "Cassia" flask on 5 c.c. of the oil the author finds that with pure cineol, or with eucalyptus oils rich in cineol, results comparative with either the H_3PO_4 or the resorcinol methods may be obtained. But with low percentage oils of the *Amygdalina* type the results are quite valueless, being greatly in excess of the figures obtainable by either of the methods named. It has been suggested that the process may be used to determine other unoxidizable constituents of oils, either natural or added.

Cineol, Determination of, by the Resorcinol Method. C. T. Bennett. (*Perfum. Record*, 1912, **3**, 276.) Data are given to show that the resorcinol absorption method, even when applied to the cineol-containing fractions of eucalyptus or cajuput oils, may give results much above accuracy. Until a better method is known, the H_3PO_4 process is to be preferred.

Cineol, Determination of by the H_3PO_4 Method with Petroleum Ether. (*Evans' Analyt. Notes*, 1912, **7**, 35.) The addition of petroleum ether in the proportion of 2·5 vols. to 1 vol. of the oil to be tested by the H_3PO_4 method, as official in the U.S.P., gives results for cineol—which are 11 to 12 per cent. lower than those obtained by standard pressure between absorbent paper, without the addition of petroleum.

Cinnamomum Glanduliferum Bark, Essential Oil of. S. S. Pickles. (*J. Chem. Soc.*, 1912, **101**, 1433.) *Cinnamomum glanduliferum* Meissn. is a large tree occurring in the Southern Himalaya, and known as "Nepal sassafras" or Nepal Camphor. The oil (yield 2·95 per cent. of original material) was a clear, pale yellow, possessed an odour resembling that of safrol, with, however, a suggestion of anise. General characters: sp. gr. 1·1033; α_D $-0°4'$; saponification value, 2·8; acetyl value, 7·0. It is soluble in EtOH. No terpenes were found and acids, alcohols, esters, aldehydes and ketones are either absent or are present only in very small quantity. The oil consists almost entirely of ethers, and the nature of these demonstrate in a remarkable manner the capacity of certain plants for producing different chemical compounds of a similar type. The three compounds which constitute the bulk of the oil are safrol, myristicin and elemicin. There are small quantities of other substances present, including palmitic acid, which is in the free condition, a phenolic substance, and a mixture of the lower fatty acids in the form of esters.

Citronella Oil, New Method of Analysis of. V. Boulez. (*Bull. Soc. Chim.*, 1912, **11**, 915.) To 25 or 50 Gm. of the oil in a 500 c.c. Erlenmeyer flask add 100 or 200 Gm. of $NaHSO_3$ solution saturated with Na_2SO_3, agitate until reaction is complete, let stand 2 or 3 hours, add 100 or 200 c.c. of distilled water, heat on a water bath for several hours under a reflux condenser, shaking from time to time. When the dissolved aldehyde-sulphite and unreacted oil have formed two distinct layers the latter is separated and weighed. The difference in the weight and that

of the original is taken to be total aldehyde. The unreacted oil is acetylized in the usual manner, and the amount of alcohol is determined. (See also *Y.B.*, **1906,** 24; **1910,** 66; **1912,** 81, 82, 83.)

Citronella Oil, Javan Valuation of. J. C. Umney and C. T. Bennett. (*Perfum. Record*, 1912, **3,** 250.) After reviewing the results obtained by Schimmels, De Jong, and Durrans, indicating that various modifications in the methods employed for acetylization may affect the results, the authors finally recommend the following process for the acetylization of the oil: Ten c.c. of the oil are gently boiled under a reflux condenser with 20 c.c. acetic anhydride and 2 Gm. anhydrous sodium acetate for two hours. The oil is then washed with brine, such washing being made with brine containing 1 per cent. of caustic potash. A drop of phenolphthalein is added to the brine, and if this, after shaking with the oil, separates in a colourless condition the washing with alkaline brine is repeated. When neutral, the oil is separated, dried by contact with anhydrous potassium sulphate, and from 2 to 3 Gm. is saponified with semi-normal alcoholic potash for one hour in the usual manner.

Citronella Oil, Estimation of Geraniol and Citronellal in. C. T. Bennett. (*Perfum. Record*, 1913, **3,** 334.) It would appear from Schimmels' experiments (Semi-Annual Report, October, 1912, p. 47) that Boulez's method by which both constituents can be determined on the same portion of oil gives results which are very near the truth, although the proportion of aldehyde absorbed is invariably high, to the extent of about 10 per cent., evidently owing to the solubility of other constituents of the oil in the bisulphite solution. The method is given above (p. 73, *ante*).

The author finds the method for citronella oils to give concordant results; it is likely to prove useful where aldehydes and alcohols occur together in essential oils.

That part of the oil other than the aldehydes is absorbed by the bisulphite solution is proved; since the separated bisulphite solution yields a small quantity of oil when extracted with ether. A correction for this solubility should therefore be made, and, with this modification, Boulez's method gives practically theoretical results, and is preferable to any other yet published.

Citronella Oil, Analysis of. Dupont and Labaune. (*Roure-Bertrand's Report*, April, 1913; *Perfum. Record*, 1913, **4**, 167.) The authors agree with Schimmels' criticisms of the methods of analysis of citronella oil, that the geraniol in citronella oil is accompanied by other alcohols, which enter into reaction when the substance is acetylated, and that the presence of esters in the oil is likewise a source of error.

The process recommended by the authors consists in treating the oil in the cold with hydroxylamine in a neutral or feebly alkaline medium. The citronellal is thereby converted into the oxime, which on acetylation is transformed into the nitrile, whilst the geraniol and other alcohols are converted into esters. The acetylized oil is then saponified, and the alcohols alone are thus determined. By deducting these from the total geraniol and citronellal determined by the usual method, the percentage of citronellal is calculated by difference.

They show that citronellal is difficult to obtain in a pure condition, since it invariably contains iso-pulegol, and hence the results obtained on mixtures of geraniol and citronellal always indicate a slightly higher figure for the alcohols, and the figure for citronellal is correspondingly low.

Further, the authors agree with Schimmels as to the value of the phthalic anhydride process for the determination of geraniol. This consists in heating 2 Gm. of the oil with 2 Gm. of phthalic anhydride, and 2 c.c. of C_6H_6 for 2 hours on a water-bath. The mixture is allowed to cool, and shaken for 10 minutes with 60 c.c. of N/2 KOH in a stoppered flask. At the end of this time the anhydride is converted into neutral phthalate, and the acid geranyl ester into its potassium salt. The excess of alkali is titrated with N/2 H_2SO_4. By deducting from the proportion of alkali absorbed by the quantity of phthalic anhydride used, the quantity of alkali used up in the experiment, the quantity of alkali absorbed by the geranyl ester is obtained, and hence the percentage of geraniol can be calculated.

Boulez's method is criticized, since the results obtained for citronellal are too high.

Clove Oil, Adulterated. (*Schimmels' Report*, Oct., 1912, 48.) A sample of clove oil, which was dextrorotatory, was found to be adulterated with castor oil.

Clove Oil, Determination of Eugenol in, by KOH Absorption. (*Evans' Analyt. Notes*, 1912, **7**, 23.) For the phenol determina-

tion in clove oil 5 per cent. aqueous KOH is to be preferred to 3 per cent. The latter gives results about 5 per cent. too low.

Clove Oil Distilled under Reduced Pressure. (*Evans' Analyt. Notes*, 1912, **7**, 23.) A sample of cloves was distilled with steam, but under reduced atmospheric pressure so as to obtain the essential oil appreciably below 100°C. This was found to have the following characters :—

Sp. gr. 1·0475 η_D 1·533 α_D $-1°25'$

The bouquet of this oil was surprisingly sweet and soft, although without the fruity character noted when methylamylketone predominates ; it was quite distinct from ordinary clove oil, and evidently closely resembled the true odour of the flowers, owing no doubt to the complex eugenol esters present having been only slightly changed. As a perfume product this should be of value. Although the oil was initially almost colourless, it darkened, the furfural content evidently being normal.

Copaiba Oil, Some Distinctive Constituents and Reactions for. E. Deussen and B. Eger. (*Chem. Zeit.*, 1912. **36**, 561.) The oil of Para copaiba contains 5·15 per cent. of β-caryophyllene, while Maracaibo balsam contains only 2 per cent. Consequently when a current of NO is passed through an Et_2O solution of these oils from 14 to 15 per cent. of β-nitrocaryophyllene is obtained from the one, and 5 to 8 per cent. from the other. The presence of gurjan balsam oil in copaiba oil may be confirmed by the preparation of gurjene ketone semicarbazone. The oil is fractionated under 10 to 12 mm. pressure. The portion boiling above 145° is rejected. The lower fractions are oxidized with $K \cdot MnO_4$ in acetone solution. The semicarbazone melts at 234° C. and the $\alpha_D + 317°$ in chloral hydrate solution.

Crithmum Maritimum, Oil of, from Sardinia. L. Francesconi and E. Sernagiotto. (*Atti R. Accad. dei Lincei Roma*, 1913, **22**, I., 231, 312, 382 ; *J.S.C.I.*, 1913, **32**.) The oil was obtained by distillation with steam under a pressure of $2\frac{1}{2}$ atmospheres. The yield from the entire plant was 0·16 per cent. and the oil had the sp. gr. 0·9816 at 29°C., $\eta_D = 1·4978$, $\alpha_D = + 3·18°$, saponification value, 6·50, after acetylation, 11·24, esters, 2·27 per cent. ; combined alcohols, 1·80 per cent. ; free alcohols, 1·30 per cent. On distillation in a slow current of steam at atmospheric pressure the oil was separated into a volatile (51·6 per

cent.) and a non-volatile portion (48·4 per cent.). The former consisted chiefly of terpenes; it had the sp. gr. 0·8612, η_D = 1·4761, $\alpha_D = 5·83°$. The oil differs in character from that previously described by Borde and by Délépine. Its chief constituents are α-phellandrene, dill-apiols, *p*-cymene, paraffin, and a new terpene, *critmene*, which has been identified as β-terpinolene. Critmene is optically inactive; it boils at 178° – 180°C. at 759 mm., has the sp. gr. 0·8679 at 12°C., and η_D = 1·4806 It yields two isomeric nitrosochlorides (α, m.p., 101° – 102°C.; β, m.p., 104°C.), and nitrolpiperides (both melting at 138°C.), a nitrolbenzylamine derivative (m.p., 104°C.), a nitrosate (m.p., 104°C.) and a nitrosite (m.p., 89°C.). (See also *Y.B.*, **1910,** 68.)

Cubebs, Essential Oil of, and the Fruits at present found in Commerce. J. Dekker. (*Perfum. Record*, 1913, **4,** 89.) Commercial cubeb oil has lately been found to have abnormal characters. Dekker has been able to separate a parcel of "cubebs" into four different kinds of fruits. It is possible that the oil in question is derived from the fruit referred to by him as "class 3," which may be the "cubeb sauvage" mentioned by Planchon and Collin. The following is a summary of the results obtained by Dekker.

In a quantity of 500 Gm. of cubebs were principally found four different kinds of fruit, which have been sorted out and classified as follows:—

Class 1.—Real cubebs, i.e., those showing both macroscopically and microscopically the features of *Piper cubeba*, producing, if touched with concentrated H_2SO_4, the well-known red colour.

Class 2.—Much resembling real cubebs, but outwardly shrivelled, with longer and broader tail than of real cubebs. This kind gave a yellow colour with concentrated H_2SO_4.

Class 3.—Not resembling real cubebs at all—without tail and showing a totally irregular microscopic figure—colouring yellow with concentrated H_2SO_4.

Class 4.—Much resembling real cubebs, but larger and with a different design of the network. These give a yellow colour with concentrated H_2SO_4.

The various isolated kinds have then been distilled, and also the branches and the original (unassorted) sample:—

1. *Original Sample.* Yield of oil, 14·44 per cent.; colour of

oil, light green; η_D 15°C., 1·4955; α_D 15°C., –29·12; sp. gr., 15°C., 0·922. 2. *Branches of Original Sample.* Yield of oil, 1·67 per cent.; colour of oil, dark green; η_D 15°C., 1·5011; α_D 15°C., –21·76; sp. gr. 15°C., 0·938. 3. *Assortment of Same Sample.—Class* 1. Yield of oil, 17·78 per cent.; colour of oil, light blue green; η_D 15°C., 1·4964; α_D 15°C., –29·60; sp. gr., 15°C., 0·924. 4. *Assortment of Same Sample, Broad-tailed. Class* 2. Yield of oil, 11·56 per cent.; colour of oil, yellow-green; η_D 15°C., 1·4928; α_D 15°C., –11·24; sp. g. 15°C., 0·912. 5. *Assortment of Same Sample, Without Tail. Class* 3. Production of oil, 7·21 per cent.; colour of oil, slight-yellow; η_D 15°C., 1·4970; α_D 15°C., +14·24; sp. gr., 15·C., 0·922. 6. *Assortment of Same Sample; larger kind. Class* 4. Yield: 13·3 per cent. of light green oil; sp. gr., 0·923; α_D–33·6; η_D 15°C., 1·4924. This sample did not, therefore, consist solely of true cubebs. It contained a fruit yielding an oil quite distinct from genuine cubeb oil. Some of these give a dextrorotatory oil. The H_2SO_4 test is excellent for the differentiation of true from false cubebs. All those fruits which give a yellow colour with that reagent yield oils which have not the physical characters of true cubeb oil.

Cummin, Persian. J. C. Umney and E. M. Holmes. (*Perfum. Record*, 1913, **4**, 43.) The fruits of Persian cummin, identified as *Carum gracile*, yielded 2 per cent. of oil, having the following characters: sp. gr., 0·911; α_D + 7°; η_D20° 1·4980; aldehydes by absorption with $NaHSO_3$, 18 per cent. Practically all the oil distilled below 240°C. The oil is distinctly pleasanter and more like caraway than ordinary cummin oil.

Eliornurus Tripsacoides Oil. (*Perfum. Record*, 1913, **4**, 98.) This Bolivian grass, distilled in England, yielded 0·1 per cent. of yellow oil, with an odour somewhat resembling that of vetivert. With Fe_2Cl_6 it gave a reddish violet colour, due to the presence of a trace of a phenol, probably eugenol. The oil had the following characters: sp. gr., 0·976; α_D, –10; ester value, 10·5; acetyl value, 42. The b.p. of the oil was very high, indicating the presence of a sesquiterpene as the chief constituent. No constituents boiled below 275°C.

Essential Oils, Determination of Glyceryl Acetate in. S. G. Hall and A. J. Harvey. (*J.S.C.I.*, 1913, **32**, 61.) Ten Gm. of the oil is mixed with about 50 c.c. of EtOH, sp. gr.

0·830, and saponified with N/2 alcoholic KOH; then digested on the water-bath for one hour; the solution is now neutralized by means of N/2 HCl and evaporated to dryness on the water-bath; about 20 c.c. of water are added, and the oily portion extracted by Et_2O, the water solution being run into a 6-oz. round-bottomed flask: the Et_2O extract is again washed with a further quantity of about 10 c.c. of water, which is then added to that already in the flask and the whole evaporated to a syrupy consistence. This residue now contains the glycerol originally present as glyceryl acetate, which is estimated in the usual way by the triacetin method, as follows: To this residue 3 Gm. of fused Na $C_2H_3O_2$ is added together with 8 c.c. of acetic anhydride and the whole refluxed for one hour at a gentle heat, then cooled and 50 c.c. of boiled, distilled water added. The contents of the flask are now raised to a temperature of 80° C., again cooled, filtered and washed into a 30-oz. flask. A few drops of phenolphthalein are added and a sufficiency of NaOH solution of about normal strength, to just neutralize the excess acetic acid, care being taken to ensure thorough mixing. A known excess of N/2 NaOH is now added and the whole gently boiled under a plain tube reflux for fifteen minutes, then cooled and titrated with N/2 HCl. Each c.c. of N/2 NaOH used up = 0·01535 glycerol = 0·03641 glyceryl acetate. It is advisable always to do a blank test, using only the acetic anhydride and sodium acetate and boiled with 5 c.c. N/2 sodium hydroxide. (See also *Y.B.*, **1911,** 58, 67.)

Essential Oils, Preservative Action of. J. R. Rippetoe and L. E. Wise. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 1273.) The report presents in systematic form the preservation value of a number of essential oils used in pharmacy, for flavouring purposes. The efficacy of the oil has been roughly gauged by its power to arrest the growth of mould in a 50 per cent. glucose solution, and a 50 per cent. sugar solution containing extract of meat and peptone, within certain periods of time. All results of this work should be taken qualitatively.

A large amount of experimental work is thus summarized. The following oils act as preservatives. Bitter almond, bitter almond without HCN, betula, cajuput, cardamom, cassia, chenopodium, cinnamon, citronella, cloves, coriander, cummin, eucalyptus, rose geranium, horsemint, lavender, mace, marjoram, mustard art., neroli, origanum, peppermint, pimento, tar, rose,

rosemary, sassafras and thyme and menthol, terpineol and thymol.

Oils of angelica, calamus, celery, cubeb, lemon, orange peel, black pepper, pinus, pumilio, sandal and turpentine do not act as preservatives.

The preservative action of the following is questionable: oils of anise, bergamot, caraway seed, dill, fennel, ginger, hedeoma, juniper berries, lemongrass, nutmeg, pine (*Abies pectinata*), spearmint and tansy and citral. (See also *Y.B.*, **1911**, 66.)

Essential Oils, Solubility of Water in. J. C. Umney and S. Bunker. (*Perfum. Record*, 1912, **3**, 197, 325; **4**, 4, 36.) The amount of water dissolved by the commonly occurring essential oils has been determined by taking the η_D at 25° C. before and after drying. The percentage of water, indicated by the observed differences was determined by Gladstone and Dale's formula. The results are expressed in a table comprising over sixty different essential oils. The lowest figures, less than 0·06 per cent. of water, are found with oils of dill, anise, orange, bergamot, caraway cassia, chenopodium, cinnamon (bark and leaf), citronella, copaiba, eucalyptus, gaultheria, French geranium, juniper, limes, lemon, English peppermint, nutmeg, thyme, petit-grain, *Pinus canadensis*, *P. pumilio*, *P. sibirica*, rosemary, savin and sandalwood. Of the oils containing water, pimento with 0·94 per cent. and almonds with 0·7 per cent. of dissolved water, were the highest. Although water does not occur in sufficient quantity in any case to materially affect the cost of the oil, yet its presence is to be deprecated, as it may cause trouble in compounding, apart from its influence on the keeping properties of oils. It is therefore desirable that only dried oils should be put on the market.

Experiments have been performed with the different groups of oils, to determine how far the presence of moisture, light and air affect the characters of the oils under observation. These were carried out under the following heads: (1) wet, light, air; (2) wet, light, no air; (3) wet, dark, air; (4) wet, dark, no air; (5) dry, light, air; (6) dry, light, no air; (7) dry, dark air; (8) dry, dark, no air.

The results are given in a number of tabular statements. The "wet" oil was in the condition as received from the distillers. The "dry," a portion of the same freed from water by means of anhydrous Na_2SO_4.

Taking the "terpene" group as a whole, the results lead to

the conclusion that the sp. gr, α_D and η_D all undergo decrease on keeping the oil under the various conditions. So long as the oil is kept in the presence of light and air it does not make any material difference whether moisture be present or not. This is quite in accord with the former results obtained, that this group of oils is practically incapable of dissolving any appreciable quantity of water.

Taking the "alcohol" group as a whole, the results point to the fact that general increase in sp. gr. is to be expected on keeping; this is unaccompanied by any change in the α_D, but is generally coupled with a lowering of the η_D. Considered collectively, the alcohols show a general decrease in their "total alcohol" value, which is more marked and irregular in the "wet" oils than in those which have been subjected to a drying process. There appears to be no uniformity in the conditions for the production of least colour.

Considered collectively, the "aldehyde" group cannot be said to afford much evidence of a general character, as in some cases the constants increase and in others decrease. In this series it can only be stated that the results found apply to the oils for which they are given, and cannot be made the basis of any general deductions. This may be explained in some measure by the different nature of the oxidation products of the chief constituents of these oils. Whereas in cassia oil, cinnamic aldehyde occurs, which is a comparatively simple chemical body, and which oxidizes to cinnamic acid, yet in lemongrass and citronella oils the aldehydes present break down on oxidation, and do not form an acid derivative. This effect is further complicated by the presence of a considerable percentage of geraniol in the citronella oil. These three oils cannot therefore be considered to be of analogous composition.

The "phenol" series affords some general results of a curious character. In these oils moisture and light produce the greatest increase in both η_D and sp. gr., while the lowest figure for these constants is uniformly found in moisture and darkness. The liability to change is much less marked in the case of "dry" oils, in which the presence of air seems favourable to an increased value of the constants, in distinction from the "wet" oils, in which its absence produces this effect. (See also *Y.B.*, **1911,** 89.)

Essential Oils, Unification of Processes for the Commercial

Analysis and Valuation of. J. C. Umney and E. J. Parry; also P. Jeancard. (*Internat. Congress of Applied Chem.; Perfum. Record*, 1912, **3**, 245, 248.) The original communications should be consulted.

Eucalyptus Citriodora Oil from Mauritius. (*Bull Imp. Inst.*, 1913, **11**, 48.) Two samples of this oil, having the characteristic citronella odour of the oil, had the following characters: sp. gr., 0·877 and 0·879; α_D + 0°4′ and + 1°16′; acetylizable constituents, 81·1 and 87·1 per cent.; soluble 1 : 3 and 1 : 2·6 in Et_2O 70 per cent. (See also *Y.B.*, **1906**, 299.)

Eucalyptus Globulus Oil, U.S.P. Solubility Test for. F. E. Mortenson. (*J. Amer. Pharm. Assoc.*, 1913, **2**, 185.) The oil of *Eucalyptus globulus* leaves, although it contains 60 to 70 per cent. of cineol, is not soluble 1 : 3 of alcohol 70 per cent. as required by the U.S.P. solubility test. On fractionation, it is found that the first 60 per cent. distilling will not be soluble in this proportion.

Eucalyptus Oils, New. R. T. Baker and H. G. Smith. (*Proc. Royal Soc., N.S.W.*, **45**, 267; *Schimmels' Report*, Oct., 1912, 63.) *Oil of Eucalyptus acaciæformis.* Deane et Maiden. This species is known as "red" or "narrow-leaved peppermint," and is widely distributed throughout N.S. Wales. The leaves yielded 0·197 per cent. of an oil which in the crude state possessed a brown colour and a turpentine-like odour: sp. gr., 0·8864, α_D + 35·7°; $\eta_{D20°}$ 1·4713; insoluble in 10 vols. 80 per cent. alcohol. Its principal constituent is $_D$-pinene, and it also contains the sesquiterpene of the eucalyptus oils (aromadendrene), and probably geranyl acetate.

Oil of Eucalyptus andrewsi, J. H. Maiden. This was formerly regarded as a variety (*Oxleyensis*) of *E. sieberiana*, but has been recognized as a separate species. The yield of yellow oil was to 1·27 per cent.; sp. gr., 0·8646; α_D − 41·5°; $\eta_{D15°}$ 1,4854; ester value, 4·3; insoluble in 10 vols. 80 per cent. EtOH. The main constituents were *l*-phellandrene, piperitone and sesquiterpene. Pinene does not appear to be present and cineol was scarcely traceable.

Oil of Eucalyptus campanulata, Baker et Smith. The leaves yielded 0·851 per cent. of pale yellow oil: sp. gr., 0·8804; α_D 25·8°; η_{D18} 1,4856; saponification value, 7·6; barely soluble

in 10 vols. 80 per cent. EtOH. It contained phellandrene, cineol, piperitone and eudesmol.

Oil of Eucalyptus bridgesiana. The yield amounted to 0·73 to 0·745 per cent. Sp. gr.; 0·9223 to 0·9246; α_D + 1·9 to + 1·8°; $\eta_{D20°}$ 1,4716 to 1,4729; saponification value, 8·7 and 7·6. The cineol-content was 73 and 78 per cent.

Oil of Eucalyptus lævopinea. The crude oil was found to possess the following characters: sp. gr., 0·8875 and 0·8871; α_D—30·7 to 33·3°, $\eta_{D19°}$ 1,4691 to 1,4697. It does not contain above 5 per cent. cineol.

Oil of Eucalyptus dextropinea. Yield of oil, 1·02 per cent.; sp. gr., 0·8831; α_D + 24·2°; η_D 1,4668; saponification value, 22·1; soluble 1 : 10 in EtOH, 80 per cent. It contains 3·7 per cent. of geranyl acetate.

Oil of Eucalyptus nova-anglica. Sp. gr., 0·9221 to 0·9301; α_D + 6·9 to 5·8; $\eta_{D15°}$ 1,4892 to 1,4944; saponification value, 5·7 to 6·9; cineol content small; sesquiterpenes present in considerable proportion. Phellandrene occasionally present in small amounts. (See also *Y.B.*, **1905,** 73 and *Gen. Index.*)

Farnesol. M. Kerschbaum. (*Berichte,* 1913, **46,** 1732.) Farnesol, $C_{15}H_{26}O$, is an aliphatic sesquiterpene alcohol. It occurs in lily-of-the-valley flowers, lilac, acacia, lime-tree blossom, and also in abelmoschus seeds, in the latter to the extent of 0·12 per cent. It reduces $KMnO_4$. When pure it is almost odourless: the odour only becomes apparent when greatly diluted. When heated with $KHSO_4$ to 160–170° it splits off water and forms the sesquiterpene *farnesene* $C_{15}H_{24}$. By oxidation with CrO_3 and dilute H_2SO_4 it yields the aldehyde *farnesal*, $C_{15}H_{24}O$, a colourless oil with a feeble odour. This reduces alkaline Ag solutions with formation of a mirror.

Fennel Herb Oil. (*Schimmels' Report, April,* 1913, 111.) An oil distilled in Jersey from *Fœniculum vulgare* was a colourless liquid with an odour of tarragon and was soluble 1:5 of 80 per cent. alcohol, with slight turbidity; sp. gr., 0·9561; α_D + 16°40′. The oil only contains a very small proportion of anethol, but, judging by its odour, methylchavicol is an important constituent.

Juniper Oil, from Shrub, Characters of. (*Southall's Report,* 1913, **21,** 29.) A specimen of juniper oil, distilled from the whole shrub, gave the following characters:—Sp. gr., 0·854; ester value, 1·15; acid value, 0·19; value of acetyl, 14·49;

ketones, aldehydes, and phenolic bodies, absent; α_D, $-1{\cdot}00°$; η_D, 1·4711. The figures differ widely from those of the commercial so-called juniper "wood" oil.

Juniperus Phœnic- Fruit, Oil of. (*Perfum. Record*, 1913, **3**, 291.) The oil, distilled in Cyprus, has the sp. gr. 0·867; $\alpha_D + 5°$; $\eta_{D20°}$ 1,4708.

Lemon Oil, Suggested Solubility Tests for. (G. Patané. (*Schimmels' Report*, Oct., 1912, 61.) Equal volumes of lemon oil and alcohol, 80 per cent., at exactly 20°C., are shaken up together in a 10 c.c. tube, graduated to 0·1 c.c. After complete separation, the increase of volume of the alcohol layer is read off. Another test consists in warming mixtures equal volumes of the oil and alcohol until complete solution is obtained, then stirring with a thermometer graduated to 0·1°C. while the liquid cools, and noting the temperature of the appearance of turbidity the addition of one per cent. of terpenes is stated to raise the clouding temperature by 1°C. These tests are claimed to give useful comparative results.

Lemon Oil, Terpeneless, Characters of. E. Sachsse. (*Perfum. Record*, 1913, **4**, 47.) Terpeneless lemon oil of good commercial quality may range in sp. gr. from 0·890 to 0·930; α_D from $-6°$ to $-9°$; citral content from 42 to 50; solubility in alcohol 70 per cent. 1 : 40 to 1 : 80 (sometimes cloudy); in alcohol 60 per cent. 1 : 150 to 1 : 300 (often cloudy); in alcohol 50 per cent. 1 : 500 to 1 : 1,000 (generally cloudy). Lemon oil which is sesquiterpeneless as well as terpeneless has the sp. gr. 0·895 to 0·905; α_D $-1°$ to $-4°$; citral content 64 to 74 per cent.; solubility in alcohol 70 per cent 1 : 16 to 1 : 20; in alcohol 60 per cent. 1 : 6 to 1 : 10; in alcohol 50 per cent. 1 : 75 to 1 : 125. All these solutions are clear.

Lemongrass Oil, Changes in, with Age. E. J. Parry. (*Perfum. Record*, 1913, 4 40.) Lemongrass oil which when tested in the West Indies before shipment was perfectly soluble 1 : 3 alcohol 70 per cent. was found not to be soluble on arrival over here. The change is probably due to oxidation of an olefinic terpene. After storing for several years a diminution of the citral content by 4 to 5 per cent. was observed. Cochin lemongrass oil behaves similarly.

Lemongrass Oil and Citronella Oil, Burmese. (*Perfum. Record*,

1913, **4,** 3.) The oil produced in Burma undoubtedly differs in solubility and citral content according to the climatic conditions prevailing during the cutting of the grass. The yield of oil is less when the grass is cut during the dry season, than when it is harvested during the rains. The oil already examined in this country had the sp. gr. 0·893 ; citral, 74 per cent. ; soluble with slight opalescence in EtOH 90 per cent., not clearly soluble in EtOH 70 per cent. The oil distilled in Burma from so-called "scented" lemongrass is evidently from a distinct species. It is closely allied in character to Javan citronella oil. One specimen, with the sp. gr. 0·896, gave over 100 per cent. of acetylizable constituents when calculated as citronellal and geraniol : another, sp. gr. 0·893, gave 91·5 per cent. This citronella is regarded as a panacea in Burmese domestic medicine. It undoubtedly has decided antiseptic properties.

Lemongrass Oil, Indian. (*Bull Imp. Inst.*, 1912, **10,** 546.) Four specimens examined had the following characters. "*Tyrna oil*" : sp. gr., 0·9039 ; α_D — 0°30′ ; citral by $NaHSO_3$ method 72·2 per cent. "*Cochin oil*" : sp. gr., 0·8973 ; α_D —0°40′ ; citral, 81·5 per cent. "*Mariani oil*" : sp. gr., 0·8973 ; α_D — 0°20′ citral, 78 per cent. "*Ceylon oil*" : sp. gr., 0·9109 ; citral, 73·7 per cent. None of these were completely soluble in alcohol 70 per cent.

Marjoram Oil, Cyprian. (*Bull. Imp. Inst.*, 1913, **11,** 50.) Cyprian marjoram oil approaches in characters the oil distilled from sweet marjoram *Origanum majorana*. The actual botanical source of the oil is uncertain, being referred by Stapf to *O. majoranoides* and by Holmes to *O. maru*. Two samples distilled in Cyprus had the following characters : sp. gr., 0·899 and 0·9126 ; α_D + 14°2′ and + 3°45′ ; saponification value, 6·4 and 8·25 ; acetyl value, 71·22. Both very soluble in EtOH 80 per cent.

Marjoram, Oils of, from Different Species. (*Perfum. Record* 1913, **4,** 74.) The following is a brief description of the various oils which have found their way into the English and Continental markets.

1. *Oil of Sweet Marjoram.*—Derived from *Origanum majorana*, principally distilled in Spain. Pale yellowish in colour, with the characteristic odour of the herb ; sp. gr., 0·890 to 0·912 ; α_D + 5° to + 18° ; usually soluble 1 : 3 of 80 per cent. alcohol.

This oil contains no thymol nor carvacrol, but consists largely of terpenes, principally terpinene, with some terpineol and a small quantity of stearoptene, the constitution of which has not yet been determined.

An oil of marjoram distilled in Cyprus, examined 1908, which corresponded with the characters above described, and also with those of an oil recently distilled from herb grown in France, the source of which has been authenticated.

This oil must not be confounded with the oil of wood marjoram derived from *Thymus mastichina* (*Y.B.*, **1911,** 88).

2. *Cyprus Origanum Oil.*—Derived from *O. majoranoides. Willd.* Imported in commercial quantities. It is an oil rich in carvacrol, pale yellow in colour when freshly distilled, but becoming darker on keeping; sp. gr., 0·961 to 0·967; carvacrol, 78 to 84 per cent.; soluble 1 : 2 to 1 : 3 in 70 per cent. alcohol; it also contains cymene, a characteristic terpene origanene, and a small quantity of another phenol, considered to be hydroxy-methoxy-cymene, which gives a violet colour with Fe_2Cl_6.

3. *Trieste Origanum Oil.*—Hitherto considered to be obtained from *Origanum hirtum*, but now proved to be derived from *Origanum onites*. This oil has a specific gravity of 0·940 to 0·980, contains 60 to 85 per cent. of carvacrol, and is soluble in 2 to 3 volumes of 70 per cent. alcohol.

4. *Oil of Origanum hirtum.*—This oil has a sp. gr. 0·944, thymol 66·67 per cent., but no carvacrol, and is soluble in 2·8 volumes of 70 per cent. alcohol.

A similar oil distilled from plants cultivated in the Adriatic Islands of Curzola and Lissa had a specific gravity of 0·923–0·940, and contained 51–60 per cent. of thymol, but no carvacrol. The species from which this oil was obtained was identified *O. hirtum*, var. *albiflorum* (Hassk). It therefore appears that oil of *O. hirtum* generally contains thymol and not carvacrol.

Oil of Origanum maru.—The herb from which this oil was distilled by Schimmels may possibly have been mixed with *O. hirtum*. Two specimens of oil had the characters: sp. gr., 0·9539 and 0·9474; α_D + 0°35′ and + 0°50′ carvacrol, 72 per cent. in one, and total phenols 67 per cent. in the other. These were thymol and carvacrol in equal parts.

Oil of Smyrna origanum.—Botanical source uncertain; sp. gr., 0·915 to 0·945; carvacrol, 25 to 60 per cent. Contains linalol. This oil has not been met with recently on the English market.

Oil of Origanum vulgare is no longer distilled commercially.

It is stated to have the sp. gr. 0·870 to 0·910; α_D - - 34·4; and to contain only traces of phenols.

Melaleuca Oils. R. T. Baker and H. G. Smith. (*Proc. Roy. Soc., N.S.W.*, **45**, 365; *Schimmels' Report*, Oct., 1912, 81.) The authors find Cajuput oil (from *Melaleuca leucadendron*) is not a typical representative of the melaleuca oils.

Oil of Melaleuca genistifolia, Sm. The leaves and terminal branchlets collected on the coast of N. S. Wales yield 0·526 per cent. of a pale yellow oil, with a well-defined odour of turpentine, possessing the following characters: sp. gr., 0·8807; α_D + 32·7°; $\eta_{D22°}$ 1,4702, saponification value, 6·8; insoluble in 10 vols. 80 per cent. EtOH. Dextro-α-pinene, cineol 2 per cent., and a sesquiterpene were isolated. The oil contains from 80 to 90 per cent. pinene.

Oil of Melaleuca gibbosa, Labill. The leaves and terminal branchlets collected in Tasmania yielded 0·158 per cent. of deep yellow oil, with an odour of cineol and pinene: sp. gr., 0·9138; α_D + 4·5°; $\eta_{D20°}$ 1,4703; saponification value, 9·9; insoluble in 10 vol. 70 per cent., EtOH; soluble in its own vol. 80 per cent. EtOH. The oil contained 61·5 of cineol, α-pinene, a sesquiterpene, with, possibly, terpinylacetate.

Oil of Melaleuca pauciflora, Turcz. The leaves and terminal branchlets from the coast of N. S. Wales yielded 0·3 per cent. of a dark amber-coloured, somewhat viscous oil with a sp. gr. 0·9302; α_D + 3·3°; $\eta_{D24°}$ 1,4921; saponification value, 8·25; barely soluble in 10 vols. 80 per cent. EtOH. The oil only contains 8·7 per cent. of cineol. Another sample of the oil had the following characters: sp. gr., 0·9552; $\alpha_{D24°}$ 1,4923. No pinene was found present, but the oil may contain limonene or dipentene. It is possible also that it contains terpinyl acetate as well as about 5 per cent. of free terpineol.

Mentha aquatica and M. sylvestris, Oils from. (*Schimmels' Report, April*, 1913, 74.) *Mentha aquatica*, L. The dried herb yielded 0·8 per cent. of pale yellow oil with a faint odour of mint; sp. gr., 0·9553; α_D + 64°56′; $\eta_{D20°}$ 1,48276′).

Mentha silvestris, L. Yielded 0·9 per cent. of pale yellow oil; odour somewhat insipid, faintly mint-like; sp. gr., 0·9852; α_D — 132°52′; $\eta_{D20°}$ 1,46856. Menthol could not be detected in the minute quantity available of either oil. Only traces thereof were probably present. The same applies to an oil

prepared from *Mentha viridis*, L. Yield 0·17 per cent.; sp. gr., 0·9512; α_D — 52°5′.

Menthol and Peppermint Oil in Alcohol Solution, Test to Distinguish. — Durieu (*L'Union Pharm.*, 1913, **54**, 33.) If tincture of iodine is added to a solution of peppermint oil, several drops, more or less, may be added before the yellow tint of iodine is perceptible in the solution. With alcoholic solution of menthol, no iodine is absorbed, so the yellow tint is seen at once. It is often impossible to tell, by odour alone, whether a liquid is flavoured with menthol or with peppermint oil. When tincture of iodine is added directly to undiluted peppermint oil a green colour reaction results. But this is not sufficiently intense to interfere with the above test, in alcoholic dilutions.

Meum Athamanticum Herb Oil. (*Schimmels' Report*, April, 1913, 111.) The herb collected in the Hartz Mountains yielded 0·88 per cent. of a deep reddish-brown oil with a celery-like odour. Soluble 1 : 3 of 90 per cent. alcohol; sp. gr., 0·9053; $\eta_{D22°}$ 1,50327; acid value, 8·8; ester value, 63·1. White crystals separated out from it, which after being once crystallized from alcohol melted at 91°. They may be guajol.

Mustard, Determination of Essential Oil in. H. Penau. (*J. Pharm. Chim.*, 1912, **6**, 160.) The author finds the following method to be more accurate for the determination of allyl isothiocyanate in mustard powder than the processes usually followed. Five Gm. of the powdered mustard is introduced into a dry flask. 100 c.c. of water is added. After standing well corked for 6 hours, 20 c.c. of EtOH is added, and 20 c.c. of poppy-seed oil. The flask is then connected with a condenser and the contents are very slowly distilled from a glycerin bath into 5 c.c. of AmOH solution, sp. gr. 0·925, and 5 c.c. of water, the delivery tube being beneath the surface of this. The process is stopped when the total volume reaches 100 c.c. To this distillate 20 c.c. of N/10 $AgNO_3$ solution is run in; the flask is corked and kept in the dark for twenty-four hours. The precipitate is then removed by filtration and washed: the filtrate, rendered acid with HNO_3, is treated with HCl to precipitate the excess of Ag as AgCl, in which form it is collected and weighed in the usual manner. From these data, the equivalent of allyl isothiocyanate is deduced. The results are much more accurate

than those obtained by the direct weighing of the Ag_2S; or by the titration of the excess of Ag with N/10 AmCNS. If an entirely volumetric process, be preferred, the excess of Ag may be titrated in the usual manner, in the presence of AmOH and KI by means of N/10 KCN.

Mustard Powder, Assay of. P. Carles. (*L'Union Pharm.*, 1913, **54,** 201.) The author defends the official process of the French Codex, which with the following slight modifications and precautions will give accurate results. (1) To limit the maceration of the sample with water to one hour. (2) To mix the AmOH and N/10 $AgNO_3$ in the receiver and to distil the mustard oil and alcohol into this mixture with the end of the delivery tube drawn out fine, dipping beneath the surface of the alkaline liquid. The distillation is stopped when 70 c.c. has come over and the volume of distillate is 100 c.c. (3) After thorough shaking the mixture is set aside for 12 hours only, not for 24. It is then filtered and the first 30 or 40 c.c. is rejected, only the subsequent 50 c.c. of filtrate being collected for titration. (4) With ordinary mustard not to take more than 5 Gm. for a test; with rich mustard not more than 4 Gm., and with mustard deprived of oil not more than 3 Gm. (5) In all cases, after the first distillate of 70 c.c. has been collected as above, to collect apart another 20 c.c. of distillate, and to add to this 5 c.c. of AmOH and of N/10 $AgNO_3$ to ensure that the whole of the mustard oil is in the first distillate. The moisture at 100°C. in the mustard powder should not exceed 6 to 7 per cent. (See also *Y.B.*, **1912,** 216.)

Myrcia Acris Oil, Adulterated. (*Evans' Analyt. Notes*, 1912, **7,** 10.) Fifty per cent. of the samples examined during the year have been adulterated. In one instance the oil contained only 28 per cent. of phenols, and had an odour of amyl alcohol. Excessive quantities of terpenes were present.

Myrosin in Sinapis arvensis. E. Renversade. (*L'Union Pharm.*, 1913, **41,** 138.) *Sinapis arvensis* is very rich in myrosin. The aqueous maceration, when cautiously evaporated, gives a copious white precipitate with EtOH 98 per cent. This is a very active ferment for hydrolyzing the glucosides of various species of *Brassica* and *Sinapis*. If this precipitate is re-dissolved in water and evaporated, the dried residue resembles dry albumin. In this condition it keeps well and retains its enzymic properties.

Ocotea pretiosa Bark, Oil of. (*Schimmels' Report*, April, 1913, 76.) This Brazilian Lauraceous bark yielded 0·83 per cent. of dark brown oil with an odour of cinnamon; sp. gr., 1·120; $\eta_{D20°}$ 1,52712; soluble 1 : 6·5 of EtOH 80 per cent. It probably contains lactonic constituents: no cinnamic aldehyde could be detected. The bark has a reputation in Brazil as a remedy for gout.

Orange Oil, Jamaican and Sicilian, Relative Proportion of Terpenes in. E. J. Parry. (*Perfum. Record*, 1912, **3**, 198.) The statement which has been published that Jamaican orange oil contains no "terpeneless" oil is incorrect. The total percentage of aldehydes present, 1·2 to 1·4 per cent., is practically identical with that found in Sicilian oil, 1·3 per cent. On the laboratory scale Jamaican oil yielded 1·75 per cent. of "terpeneless" oil, compared with 1·8 per cent. obtained from Sicilian oil. The sesquiterpenes in the former amounted to 0·95 per cent. and in the latter to 0·97 per cent. The balance of expert opinion is in favour of Jamaican orange oil as having a finer flavour.

Parathymol, Action of Oxydase and of Fe_2Cl_6 on. H. Cousin and H. Hérissey. (*J. Pharm. Chim.*, 1912, **6**, 147.) When parathymol in extremely diluted aqueous solution is left for some days in contact with Fe_2Cl_6 solution, or is acted on by the oxydase of *Russula delica*, dehydro-diparathymol is formed. Two molecules of parathymol are therefore condensed, and two atoms of hydrogen eliminated to form the compound, which may be represented by the formula:—

$$(_3)(H_3C)_2{=}HC \begin{matrix} (_1)H_3C \\ (_4)HO \end{matrix} \diagdown H_2C_6 - C_6H_2 \begin{matrix} CH_3(_1) \\ CH = (CH_3)_2(_3) \\ OH(_4) \end{matrix}$$

It forms acicular crystals, m.p. 96·97°C., and crystallizing again above its melting point; also a dibenzoyl derivate, melting at 184–185°C. (See also Oxidation of Thymol, *Y.B.*, **1908**, 196.)

Peppermint Oils, Japanese and Chinese, with High Ester Contents. (*Perfum. Record*, 1913, **4**, 32.) Partially dementholized Japanese peppermint oils are now met with containing from 8·4 to 14·4 of methyl esters. In 1896 (*Y.B.*, **1896**, 316) the oil of *Mentha arvensis*, var. *piperascens*, Holmes, from plants

grown both in Japan and America, had the comparatively low ester content of 2·8 to 5·8 per cent. The cause of this marked increase may be due to altered methods of distillation, or culture, or a different species of mint may be used. These hypotheses are discussed at length ; the third is considered to be most likely. It is pointed out that the Japanese mint sent to Thoms and cultivated at Dahlem by him, which has been named *Mentha canadensis*, var. *piperascens*, Briquet, yielded oil poor in methyl esters 2·5 per cent. Also that *Mentha arvensis*, var. *piperascens*, Holmes, cultivated by Christy, gave an oil which was very deficient in menthol. It has been noted that Chinese peppermint yields oil exceedingly rich in esters, up to 16 per cent. It is possible that this Chinese plant has been introduced into Japan.

Petitgrain Oil Adulterated with Terpinyl Acetate. (*Perfum. Record*, 1912, **3,** 240.) From the increased saponification value observed between two determinations on boiling with alcoholic potash for one and two hours, the presence of terpinyl acetate was detected. It is, however, impossible to liberate and separate terpineol in a state of purity from an oil thus sophisticated. The oil in question was also examined by Schimmels, with similar results ; it had the following characters : sp. gr., 0·8968 ; α_D + 1°40′ ; acid value, 0·3 ; ester value, 112·4 ; esters (as linalyl acetate), 39·4 ; saponification value (2 hours), 121 ; saponification value (1 hour), 99—difference, 22.

Rinus Sibirica Oil. (*Perfum. Record*, 1913, **3,** 289.) A parcel of this oil of high fragrance and apparently a genuine distillate has appeared in commerce. This has the high sp. gr. of 0·932, compared with 0·900 to 0·920 usually found. The ester content, 53·4 per cent. (as bornyl acetate), is correspondingly high, 30 to 40 per cent. being the usual amount.

Sandalwood Oil. (*Evans' Analyt. Notes*, 1912, **7,** 66.) Thirty-two lots of East Indian oils distilled during the past year had the sp. gr. 0·974 to 0·980 ; α_D–13° to –20°30′ ; η_D 1·5047 to 1·5065 ; acid value, 0·7 to 2·0 ; total santalol per cent., 95·7 to 98·8 ; ester per cent., 2·4 to 5·2. Several oils of such very high santalol content, a typical one of which is quoted, may be slightly abnormal distillates : sp. gr., 0·9757 ; α_D– 16°50′ ; η_D 1·5054 ; santalol, 98·8 ; ester per cent., 3·3.

Some of these oils were not quite soluble in 6 vols., 70 per cent. alcohol (at 20°) until stored a few weeks.

When comparing the distillates subjected to the most efficient (i.e., the coolest) condensation with those from the warmest condensation, oils of higher density have been observed to be produced in the latter case. Since the refractive index is unaltered, this higher density is apparently due chiefly to the loss of small quantities of very volatile constituents, and not to an increase of the water held in solution. Thus an increase of 16° in condensation has been found to be accompanied by a rise in density of 0·005, which, from the observed reduction in yield, indicates only a very small loss of substances with very low density. (See also *Y.B.*, **1911,** 69, 82; **1912,** 104, 343.)

Theobroma Cacao, Essential Oil of Fermented Seeds of. J. S. Bainbridge and S. H. Davies. (*J. Chem. Soc.*, 1912, **101,** 2209.) The authors have isolated 24 c.c. of essential oil from the aqueous distillate obtained from 2.000 kilos of Arriba Ecuador cocoa nibs. These were the fermented nibs in their usual commercial condition, and were lightly roasted, husked, and deprived of a portion of the cacao butter before distillation. This variety of cocoa was selected as being the most aromatic. The oil obtained had the sp. gr. 0·9075 at 15°C.; $\eta_{D20°}$ 1,4728. Its aroma and flavour of cocoa were intense, and were clearly perceptible in a dilution of 1 : 50,000,000 in weak syrup. It was isolated by shaking out the aqueous distillates with purified petroleum ether, evaporating the solvent at a low temperature, and finally *in vacuo*. On fractional distillation the early fractions were found to be rich in esters. These included amyl acetate, amyl propionate, amyl butyrate; probably hexyl butyrate and hexyl propionate; and linalyl acetate. The middle fractions contained much dextrolinalol. The total dextrolinalol represents more than 50 per cent. of the oil. Octoic acid (with some hexoic and η-nonoic acids) was also found in some of the fractions.

Turpentine Oil, Indian. (*Bull Imp. Inst.*, 1912, **10,** 539.) From samples of the oil of crude and rectified oil of *Pinus longifolia* received at the Imperial Institute from India, it appears improbable that this oil can be offered as a substitute for commercial turpentine oil, since the main fractions do not distil at 165° or below. With good commercial turpentine oil 85 per cent. distils at 165°C. or under. *Pinus longifolia* oil gives no distillate at this temperature and 43 to 56 per cent. between

165–170°C. The oil *Pinus excelsa* examined was of different character; 90 per cent. of it boiled within the 157–160°C. It would probably replace French or American turpentine oil for paints and other technical purposes. This oil had a pale yellow tint; the odour was fragrant; sp. gr., 0·862; $\alpha_D + 36°40'$. The oil of *Pinus khasya* was also examined: 25 per cent. distilled at about 162–163°C. and 57 per cent. at 163–165°C. The oil was yellowish; sp. gr., 0·870; α_D 4°50′. It was considered to be of fair quality.

Turpentine Oil, Russian. E. J. Parry. (*Chem. and Drugg.*, 1912, **81,** 655.) The quality of much of the so-called Russian turpentine oil imported into this country is unsatisfactory. Schindelmeiser informs the author that natural or "virgin" Russian turpentine is never seen in this country. The oil is fractionated, the portions boiling at about the same temperature as American turpentine are largely removed, and are used in Russia for industrial purposes, the low and high boiling fractions being then mixed and exported as Russian turpentine. Authentic samples of the oil have been received with the information that normal Russian turpentine contains from 40 to 70 per cent. distilling from 155° to 160°C. and consisting chiefly of pinene. The Russian turpentine arriving in this country is of an entirely different character. The following figures are those of a number of the best available Russian turpentines on the London market, and which are, subject to some reserve, accepted as satisfactory:—

	1.	2.	3.	4.
Initial b. p.	157°	156°	157°	158°
Distils below 155°	none	none	none	none
,, 155°–160°	1%	1%	5%	11%
,, 160°–165°	44%	45%	40%	18%
,, 165°–170°	37%	35%	42%	48%
,, 170°–180°	15%	16%	10%	19%
,, above 180°	3%	3%	3%	4%
Sp. gr. at 15°	0·863	0·8635	0·863	0·868
$\eta_{D20°}$	1·4730	1·4726	1·4725	1·4748
α_D	+4°28′	+4°30′	+9°	+8°
Absorbed by 5% KOH.	nil	nil	nil	nil

A very large number of samples, however, have been even more largely deprived of their middle runnings, and contain a considerable amount of hydrocarbons boiling over 180°, and also

a considerable amount of acid bodies, which are absorbed by caustic potash.

The following are samples of this type :—

	1.	2.	3.	4.
Initial b. p.	148°	146°	146°	153°
Distils below 155°	2%	3%	5·5%	1%
,, 155°–160°	3%	3%	5%	3%
,, 160°–165° } ,, 165°–170° }	35%	34%	22%	36%
,, 170°–180°	48%	50%	46%	50%
,, above 180°	12%	10%	21·5%	10%
Sp. gr. at 15°	0·868	0·8665	0·878	0·869
$\eta_{D20°}$	1·4762	1·4756	1·4780	1·4792
α_D	+8°	+9°	+11°	+12°45′
Absorbed by KOH	6%	8·5%	7%	3%

Where Russian turpentine is used for the manufacture of disinfectants, it is probably not of much importance that it should contain a very high amount of hydrocarbons of low b.p. ; but where it is used for rectification for the manufacture of paints and varnishes, the distillation figures are of the highest importance, and it is only samples that comply with certain requirements that are remunerative.

Russian turpentine oil of fair merchantable quality should have the following characters : sp. gr. at 15°, 0·862–0·872 ; α_D + 3° to + 20° ; η_{D20}, 1·4700–1·4750 ; absorbed by 5 per cent. KOH, not more than 3 per cent. ; distils below 155°, not more than 1 per cent. ; distils below 170°, not less than 75 per cent. ; distils below 180°, not less than 95 per cent.

The following two samples are typical virgin crude Russian turpentine :—

	I.	II.
Sp. gr.	0·867	0·865
α_D	+7°50′	+10°
η_D	1·4718	1·4736
Absorbed by 5% KOH	5%	6%
Distilled below 155°	traces only	traces only
,, 155°–160°	65%	63%
,, 160°–165°	11%	9%
,, 165°–170°	13%	15%
,, 170°–180°	7·5%	7%
,, above 180°	3·5%	6%

From these two samples the tarry and acid bodies were removed, and the rectified sample, in the case of No. 1, had the following characters: sp. gr., 0·8646; α_D + 8°; $\eta_{D20°}$ 1·4890; absorbed by KOH, none; distils below 155°, none; distils 155°–160°, 68 per cent.; distils 160°–165°, 13 per cent.; distils 165°–170°, 10 per cent.; distils 170°–180°, 7 per cent.; distils above 180°, 2 per cent.

Turpentine Oil, Thermoterebenthometric Method of Testing. R. Massy. (*J. Pharm. Chim.*, 1912, **6,** 484.) The author thus modifies the Maumené test to render it applicable to oil of turpentine. The H_2SO_4 employed is adjusted to the sp. gr., 1·722 at 15°C. = 79 per cent. of real H_2SO_4. The oil to be tested must be previously rectified. Ten c.c. of the rectified oil is introduced into a 50 c.c. Dewar flask, and the temperature is noted. The H_2SO_4 is then added, constantly stirring with the thermometer. The maximum temperature is noted. The difference in the two readings is the "thermoterebenthic degree." This is practically the method suggested previously by Tortelli, who, however, applied the test directly to the unrectified oil. The author finds rectification to be absolutely necessary, since old oil of turpentine gives a much higher figure due to oxidation products than a fresher sample. So much is this the case, that as much as 10 per cent. of white spirit or other adulterant may be added without reducing the thermoterebenthic figure below the normal limit. The author finds the thermoterebenthic value of genuine rectified turpentine to be from 96·2° to 100·6°C. All these are markedly lowered by the addition of adulterants. Thus a genuine oil having the value of 98·8°C. gave, with 10 per cent. of illuminating paraffin oil, 91·3°C.; with 10 per cent. of rectified mineral oil 84·6°C.; with 10 per cent. of liqroin 82·2°C. and with 10 per cent. of white spirit 88·3°C. An old sample of pure oil unrectified gave 106°C. A recent genuine unrectified commercial sample gave 96·5°. All these results refer to French turpentine oil from *Pinus pinaster*, which is alone official in the French Codex. (See also *Y.B.*, **1905,** 164; **1908,** 159, 201; **1910,** 75; **1911,** 88; **1912,** 108.)

Turpentine Phosphorus Compound, Nature of. E. Sieburg. (*Biochem. Z.*, **43,** 289; *Chem. Abs. Amer. Chem. Soc.*, 1913, **7,** 383.) Turpentine reacts with P to form a compound, which appears to be turpentine-hypophosphorous acid, $C_{10}H_{16}O_2POH$, rather than a H_3PO_4 compound. Analysis of the salts shows

that it is a monobasic acid. Gentle oxidation converts it into turpineolphosphoric acid, $P(OH)_3OC_{10}H_{17}O$. In the animal body it undergoes a similar, if not identical, oxidation, and is excreted as terpineolphosphoric acid. This behaviour indicates that the P in the compound is probably firmly linked to the hydrocarbon, as otherwise the latter would presumably be excreted as a conjugated glucuronate.

Vetiver Oil, Constituents of. F. W. Semmler, F. Risse, and F. Schroeter. (*Berichte*, 1912, **45**, 2347.) From the fractions obtained by distilling under reduced pressure a tricyclic alcohol, *vetivenol*, $C_{15}H_{21}O$ and its ester with *vetivenic acid* were obtained. A similar ester of a dicyclic form of vetivenol also occurs in a higher fraction and several sesquiterpenes, *vetivenes* $C_{15}H_{24}$. The oil yielding these was distilled in Miltitz. Réunion oil differed in constituents considerably from the above. It contained practically no esters of vetivenic acid, and the bulk of the oil distilled *in vacuo* at a much lower temperature, below 185°C. under 10 mm. The German-distilled oil gave fractions up to 300°C. under 12 mm. The vetivenol from the Reunion oil differs in some respects from the similar alcohols in the German product.

FATS, FIXED OILS AND WAXES

Bauhinia esculenta Seeds, Fixed Oil of. Adlung. (*Chem. Rev. Fett. Harz.*, 1913, 111; *Pharm. Zentralh.*, 1913, **54**, 584.) The nuts, known as Ombanui or Ozombanui nuts by the Hereros of German South West Africa, are produced by the leguminous *Bauhinia esculenta*. The seeds are chestnut brown with a white umbilicus. They are almost tasteless when raw; when roasted they have an agreeable flavour. They contain over 40 per cent. of pale yellow oil which fluid at ordinary temperatures, and has a pleasant flavour. Iodine value, 94·4; saponification value, 189; butyro-refractive index, 65. It resembles oil of sweet almonds in character.

Beeswax, Test to Detect Oleins in. Ostrogovici and S. Petrishov. (*Bull. Soc. Stiint. Bucar.*, 1912, 127; *Répertoire*, 1913, **25**, 85.) The method depends on the formation of acrolein from the glycerin present. This is detected by Barbet and Jandrier's reagent, a solution of resorcinol in strong H_2SO_3.

About 7 Gm. of $ZnCl_2$ is melted in a small porcelain crucible; to this 1 Gm. of the beeswax is added. The cover of the crucible should first be moistened with a few drops of the reagent. It is then put on immediately after the wax has been added. The mixture is then warmed for 30 to 40 seconds: the cover is removed, and the inner surface touched with EtOH. In the case of pure beeswax, a brownish colour will result. If tallow or other fat containing glycerides be present, a red or yellowish red colour will be evident.

Bryonia dioica Seed, Fatty Oil of. A. Diedrichs. (*Chem. Rev. Fett. Harz.*, 1912, 238; *Pharm. Zentralh.*, 1913, **54,** 414.) Oil of bryony seed is a reddish yellow thick fluid at ordinary temperatures, without marked odour; η_{D40° 67·2; iodine value, 135·9; saponification value, 193; Hehner value, 95·63; acid value, 3·2; Reichert-Meissl value, 0·66; Polenski value, 0·30.

Cacao Butter, Detection of Adulteration in. — Duyck. (*Annales Chem. Analyt.*, 1912, **17,** 1405.) An authentic specimen of cacao butter, expressed under the author's supervision, had the following characters: Critical temperature in an open vessel in EtOH (sp. gr. 0·8945), 78°C.; saponification value, 196; iodine value, 31; volatile fatty acids, 0·7 per cent.; acid value, 0·6; m.p., 27°C.; butyro-refractometer reading at 40°C., 46·5; soluble in Et_2O 1 : 2, clear at 18°C.; the precipitate formed at 8°–9°C. had the m.p. 30°C. Robin has proposed a method for the detection of coconut fat in theobroma. This consists in first determining the solubility in alcohol 55·5 per cent., and then comparing this coefficient with the saponification value. With pure cacao butter a constant between 7 and 8 is thus obtained, which is considerably affected by the presence of small quantities of coconut fat. Admixtures with wax, spermaceti, margarine and paraffin can be detected, even in small amounts, by the methods generally employed. These would modify the characters given above. Coconut fat, for instance, would increase the figure for volatile fatty acids, increase the saponification value, and lower the iodine value and the refraction index. The solubility in Et_2O, Bjorklund's test, will detect wax, margarine and paraffin, especially if the m.p. of the precipitate formed when the Et_2O solution is cooled to 0°C. is observed. This will not exceed 30°C. for a pure cacao butter. The free acid value of cacao butter of good quality never exceeds 0·5 per cent., expressed as oleic acid. This test will exclude rancid theobroma oil, and

also detect admixture of Illipé and Dika butters or other acid fats. The two latter also lower the critical temperature of the EtOH solution. Any oil added to counteract the influence of the above adulterants would affect the I value. One adulterant used is the oil extracted by solvents from cacao husks and other cacao gruffs. This resembles the true expressed oil, but is less aromatic and quickly becomes rancid. Otherwise it is difficult to detect. "Green butter" may be detected by Halphen's test, based on the presence therein of a phytosterol which forms a tetrabromide with Br (see *Y.B.*, **1909,** 21). This test may be rendered much more delicate if, instead of applying it to the crude fat, it is used with the isolated phytosterols. Under these conditions, bromination is easier and precipitation of the tetrabromide by petroleum ether almost instantaneous. (See also *Y.B.*, **1906,** 17; **1909,** 20, 21, 321; **1911,** 107; and *Gen. Index.*)

Cacao Butter, "Green Butter" and Gutta Nut Butter in, Test to Differentiate Between. C. Revis and E. R. Bolton. (*Analyst*, 1913, **38,** 201.) The following is a modification of Halphen's test (*Y.B.*, **1909,** 21), and will detect the presence of 10 per cent. of green butter in theobroma oil. One Gm. of the clear filtered fat is dissolved in 2 c.c. of a mixture equal vols. of CCl_4 and petroleum ether (distilling below 40°C.). Two c.c. of this solution is placed in a test tube about 6 inches long and $\frac{1}{4}$ inch in diameter. The tube is cooled in water and a solution of Br 1 vol. in CCl_4, 1 vol., is added drop by drop with constant shaking until the Br colour is permanent, but not more than 1 drop in excess must be used. The tube is then corked and allowed to stand. If no turbidity occurs in fifteen minutes less than 10 per cent. of green butter is present. If any turbidity appears either coconut oil, or a somewhat rare theobroma oil substitute obtained from a species of gutta, is present. The method can be made roughly quantitative by comparing the turbidity obtained with that given with mixtures of known quantities of theobroma oil with coconut oil or coconut stearin. After comparing the turbidities, on adding another 2 c.c. of petroleum ether to the tubes, and mixing by inversion, the cacao butter turbidity settles down as a fine canary yellow precipitate, whereas green butter gives a slight flocculent precipitate. Cacao butter alone is completely soluble in the above CCl_4 petroleum ether mixture, whereas green butters usually become turbid

almost immediately, or on standing. Care must therefore be taken that the solutions used for testing are quite clear. Gutta nut butter may be distinguished from cacao butter by the character of the precipitate obtained as above after treatment with Br. After 15 minutes the mixture is examined by transmitted light. The turbidity due to cacao butter is absolutely non-flocculent, and any appearance of flocculent particles is characteristic of this other fat. If 2 c.c. of petroleum spirit (fraction of "petrol" distilling between 90°–100°C.) is then added, the theobroma precipitate is entirely dissolved, while the turbidity of the other fat remains insoluble. By this means the admixture of 5 per cent. of this fat with cacao butter may be detected.

Canarium Polyphyllum Seeds, Fixed Oil of. M. Krause. (*Tropenpflanzer*, 1913, 147; *Apoth. Zeit.*, 1913, **28,** 222.) The decorticated seeds yield to 68·2 per cent. of fat to Et_2O. This solidifies at 19–20°C.; m.p., 30°; saponification value, 200·2; iodine value, 59·7; Reichert-Meissl value, 4·4. The nuts are edible and the residue after extracting the fat contains 61 per cent. of proteins. The fat would probably be applicable for the margarine industry. *Canarium polyphyllum* is a native of New Guinea.

Ceresin Wax, Detection of Hard Paraffin in. (*Evans' Analyt. Notes*, 1912, **7,** 20.) Chercheffski's method is based on the relative turbidity points of C_6H_6 solutions of pure paraffins and ozokerite ceresins, the latter being soluble to the extent of 0·784 and paraffin to 4·54 per cent. at 15° in pure C_6H_6. The reported turbidity temperatures for typical samples on cooling solutions (1·8 Gm. in 4 c.c. C_6H_6 in a 10 c.c. tube) are respectively 47·4° and 24·7°C. for ceresin and paraffin.

Other standard figures given are: Pure ceresin, m.p. 68·0°, $\eta_{D78°C.}$ 1·4352; paraffin, m.p. 53·7°, η_{D78} . 1·4280; paraffin, m.p. 46·5°, $\eta_{D78°C.}$, 1·4246. The η_D 1·427 for a paraffin m.p. 54°C. has been recorded.

Five samples of yellow and bleached ceresin were thus found to contain upwards of 50 per cent. of paraffin and gave the further confirmatory figures: m.p. 54° to 57°C.; $\eta_{D60°C.}$ 1·4356 to 1·4376.

Coconut Oil, Composition of. G. D. Elsdon. (*Analyst*, 1913, **38,** 8.) The specimen of coconut oil examined had the following characters: saponification equivalent, 25·84; Wij's value, 8·71; m.p., 24°C.; Reichert-Meissl value, 7·71; Zeiss

value at 40°C., 34·90. The fatty acids were converted into methyl esters which were then separated by fractional distillation. From these the amounts of the following acids were calculated: caproic, 2; caprylic, 9; capric, 10; lauric, 45; myristic, 20; palmitic, 7; stearic, 5; oleic, 2 per cent.

Cod-Liver Oil. (*Southall's Report*, 1913, **21,** 10.) The following are the characters of a bulk sample of authentic oil, manufactured in the Lofotens during the past winter, which may be regarded as typical for pure Norwegian cod-liver oil: Sp. gr., 0·9270; saponification value, 185·8; iodine value, 165·2; unsaponifiable matter, 0·69 per cent.; η_D 1·4800; free fatty acid (as oleic acid), 0·32 per cent.

Using Wijs's method for the iodine absorption, the results showed that with the amount of oil recommended, 0·2 Gm., a variation in time of from one to three hours produced little effect. Using 0·3 Gm. of oil, the amount absorbed even in three hours was notably less. (See also *Y.B.*, **1911,** 93, 94, 106; **1912,** 114.)

Cod-Liver Oil Emulsion, Determination of Oil in. R. Briège r. (*Apoth. Zeit.*, 1913, **28,** 197, 287.) About 10 Gm. of the emulsion is weighed by difference directly into a separator and shaken out twice, with 20 and 20 c.c. of $CHCl_3$, each time for two minutes. The $CHCl_3$ is run off into a small flask, dried with 1 or 2 Gm. of anhydrous Na_2SO_4 and filtered into a small tared flask. The Na_2SO_4 and filter are washed twice with 5 c.c. of $CHCl_3$ into the tared flask. Through this a current of dry air is then aspirated, the flask being immersed in the water-bath to drive off the last of the $CHCl_3$. After 15 minutes' drying the residual oil is weighed. By this method, the amount of cod-liver oil found in emulsion prepared according to Posen Pharmacist's Formulary was 51·1 per cent., and in a sample prepared by the author, 49·8 per cent. Commercial samples of advertised German or American brands gave from 40·5 to 24·5 per cent. Criticism from the proprietors of one of these that the method does not completely extract the oil, has induced the author to modify the above process by the addition of 2·5 c.c. of dilute sulphuric acid, to be well shaken with the emulsion before shaking out with $CHCl_3$; when this is done, however, one of the emulsions in question gave less oil than the amount of oil stated on the label to be present.

Cod-Liver Oil Emulsion, Determination of Oil in. C. Mannich and L. Schwedes. (*Apoth. Zeit.*, 191 .) The author have examined a widely sold proprietary emulsion of cod liver oil and find as a means of several determinations that the percentage of oil present is 38·4. Ten Gm. of the well mixed emulsion was diluted in a separator with 25 c.c. of water, and treated with 5 c.c. of alcohol. After gentle warming, the mixture was shaken out with 30, 30, and 30 c.c. of Et_2O. The bulked Et_2O solution was dried with anhydrous Na_2SO_4, the solvent distilled off in a tared flask, the residue dried for 15 minutes and weighed. As a control, a weighed quantity of the emulsion was diluted with water, distributed over an Adams coil and after drying extracted with Et_2O, as in the Adams method for milk fat determination. As a further check, the emulsion diluted with water was treated by Gerber's acid butyrometric method. The means of all three processes was 38·4 per cent. of oil. The authors consider that Brièger's method gives low results, since some oil is lost in minute globules in the liquid separated.

Cotton Seed Oil, New Reaction for. E. Gastaldi. (*Giorn. Farm. Chim.*, **61,** 289; *Chem. Abstr. Amer. Chem. Soc.*, 1912, **6,** 3474.) To 5 c.c. of the oil add one drop of pyridine and about 4 c.c. of CS_2 containing 1 per cent. of S. Heat the mixture by immersion in a boiling water-bath. The colours obtained are twice as intense as those in the Halphen test, and the time for development shorter.

Cruciferous Seeds, Fixed Oils of. C. Grimme. (*Chem. Rev. Fett. Harz.*, 1912, 102; *Pharm. Zentralh.*, 1912, **53,** 1026.) The physical characters for the oils of the seeds of the following plants are given: *Lepidium sativum*, *Nasturtium officinale*, *Barbarea precox*, *Crambe maritima*, *Cochlearia officinalis*, *Raphanus raphanistrum* and *Camelina sativa*.

Cytisus Laburnum Seeds, Fixed Oil of. A. Diedrichs. (*Pharm. Zentralh.*, 1913, **54,** 414; *Chem. Rev. Fett. Harz.*, 1912, 238.) The seeds of the laburnum give an oil closely resembling colza in characters: $\eta_{D40°}$ 65·3; iodine value, 131·7; saponification value, 192·6.

Djave Nuts and their Fat. H. Wagner and H. Œstermann. (*Zeits. Untersuch. Nahr. Genussmitt.*, 1912, **24,** 327; *Abstr. Amer. Chem. Soc.*, 1913, **7,** 181.) The authors,

from experiments on animals, have been unable to find any of the toxic effects said to be produced by the use of these nuts. The fat has the sp. gr. 0·9137; acid value 13·1; saponification value, 186·7; iodine value, 56·2; acetyl value, 12·9; Reichert-Meissl value, 0·8; $\eta_{D40°}$ 1·4601; titre value, 53°; mean molecular weight of fatty acids, 287·1; unsaponifiable matter, 2·56 per cent. The fat is suitable for soap making, and, in the confirmed absence of toxic effects, for food.

Fatty Acid Mixtures, Experiments on the Fractional Precipitation of. Detection of Rape Oil in Mixtures. H. Kreis and E. Roth. (*Chem. Zeit.*, 1913, **37,** 58; *J.S.C.I.*, 1913, **32,** 150.) A method of detecting rape oil, and possibly coconut oil in admixture with other fats and oils, consists in treating an alcoholic solution of the mixed fatty acids with about one-tenth the quantity of $Pb2C_2H_2O_2$ required for combination with the whole of the acids, and separating the fatty acids from the Pb precipitate thus obtained. The fatty acids are then examined; in the case of rape oil they will melt at about 30°C., have a mean molecular weight of about 340, and consist chiefly of erucic acid. Coconut oil yields a mixture of acids from the Pb fraction having a melting point of about 37·5°C. and a molecular weight of 236. With other fats and oils the melting point of the fatty acids is above that of the two instances mentioned.

Henbane Seed Oil. — Utz. (*Chem. Rev. Fett. Harz.*, 1913, 7; *Apoth. Zeit.*, 1913, **28,** 43.) The occurrence of henbane seed in poppy seed (*Y.B.*, **1911,** 228) has raised the question as to the possible contamination of poppy seed oil with hyoscyamus alkaloids. It is found, however, that the fixed oil of henbane seed is itself free from alkaloids. The oil has practically no distinctive colour reactions; also, its chemical constitution and physical characters are not sufficiently distinctive to allow of its detection when mixed with poppy seed oil. The inference that oil pressed from poppy seed contaminated with henbane seed would be harmful if used for dietetic purposes, appears to be untenable.

Hydnocarpus Alpinus Fat. H. H. de Wolff and H. B. Koldewijn. (*Apoth. Zeit.*, 1912, **27,** 961.) In consequence of the poisonous effects of the so-called "cardamom oil" and "maratti fat," used in 1911 for margarine making being traced to certain *Hydnocarpus* fats, considerable attention

has been attracted to these oils. Thus, the fats of *H. anthelmintica*, *H. inebrians*, *H. wightiana*, *H. venenata*, have been examined, and all have been found to contain dextrorotatory fatty acids. The author describes the fat of *H. alpinus*. The seeds of this species yield 50 per cent. of fat to hot pressure, and 62·45 per cent. to petroleum ether. The fatty acids insoluble in water melt at 45–47°C., and have the acid value 216·5; mean molecular weight, 259; iodine value, 87·4; α_D + 51°; $\eta_{D40°}$, 1,4602.

Katiau Seeds, Fixed Oil of. (*Bull. Imp. Inst.*, 1912, **10,** 549.) The plant yielding these oil seeds from British North Borneo was identified at Kew as *Bassia mottleyana*. The seeds examined were over 3 years old, and somewhat mouldy. The kernels yielded 51·3 per cent. of greenish yellow solid fat. At the same time a specimen of native prepared katiau fat from Borneo was examined. This had a distinct odour of benzaldehyde. Since, however, the seeds gave no indication of the presence of a cyanogenetic glucoside, it is considered that this was not a normal constituent of the fat, but was added in Borneo to improve its flavour. The imported fat prepared in Borneo has the following characters: sp. gr., 0·864; acid value, 2·3; saponification value, 191·5; iodine value, 65; titer value, 36·3°C.; Hehner value, 96; Reichert-Meissl value, 0·6. The fat extracted at the Imperial Institute had the sp. gr. 0·855; acid value, 77·9; saponification value, 191·5; iodine value, 65; titer test, 36·4; Reichert-Meissl value, 0·6. The high acid value of this sample is due to the age of the seeds. (See also *Y.B.*, **1909,** 45.)

Lard, Effect of Feeds on the Properties of. C. L. Hare. (*J. Ind. Eng. Chem.*, 1913, **5,** 410.) The effect of various feeds on the iodine (Hanûs) value and m.p. of a large number of lards are thus summarized—*Corn meal:* M.p., average 43·1°C., maximum 45·6°C., minimum 40·5°C.; iodine value, average 58·08, maximum 65·04, minimum 51·50. *Coirn meal* 2, *cotton seed meal* 1: Mp., average 49·1°C., maximum 49·9, minimum 48·6°C.; iodine value, average 53·83, maximum 61·00, minimum 48·44. *Corn meal* 9, *cotton seed meal* 1: Mp., average 48·8°C., maximum 49·1°C., minimum 48·4°C.; iodine value, average 53·47, maximum 60·56, minimum 50·6. *Corn* 4, *Tankage* 1: M.p., average 44·1°C., maximum 43·7°C., minimum 44·5°C.; iodine value, average 57·03, maximum 63·98, minimum 52·70. *Corn* 9, *Tankage* 1: M.p., average

43·9°C., maximum 44·8°C., minimum 42·5°C.: iodine value, average 56·58, maximum 71·79, minimum 49·85. *Corn* 4, *cowpeas* 1: M.p., average 43·3°C., maximum 44·8°C., minimum 42·2°C.; iodine value, average 57·35, maximum 60·86, minimum 53·95. *Corn and cowpeas pasture*: M.p., average 44·4°C., maximum, 46·4, minimum 42·5; iodine value, average 56·36, maximum 57·42, minimum 53·95. *Corn* 2, *wheat shorts*, 1: M.p., average 42·4°C., maximum 44·3°C., minimum 40·1°C.; iodine value, average 60·78, maximum 65·4, minimum 56·23. *Skim milk* 9, *Corn* 4: M.p., average 42·2°C., maximum 43°C., minimum 40·3°C,; iodine value, average 59·71, maximum 65·4, minimum 57·25. *Soy bean and peanuts* both produce lards fluid at the normal temperature. *Soy bean and pasture corn, ¼ ration:* Iodine value, 102. *Soy bean and pasture corn, ¼ ration:* Iodine value, 80·18. A number of other results are tabulated. The whole series of experiments is thus summarized:—

Corn, and mixed feeds containing corn with wheat shorts, skim-milk or cowpeas, produce fats which possess like properties. Tankage produces a slightly firmer fat, while cotton seed meal produces fats which contain small amounts of unsaturated acids and which may remain solid at temperatures of 100°F. or above. The two legumes, soy beans and peanuts, produce lards which contain extreme amounts of unsaturated acids and are fluid at ordinary temperatures. Fats change in composition with remarkable readiness under the influence of certain feeds, small amounts of these feeds producing striking changes in the properties of the fats. Between the ages of four months and eight months, age of the animal has essentially no influence upon the properties of the lard. Using feeds differing as much as 5 per cent. in protein content, there is observed no change in the properties of the lards produced therefrom. With the advent of the various new feeds used in pork production, the iodine absorption number of a lard possesses no value as a means of detecting adulteration.

Manketti Nuts, Fixed Oil of. C. Grimme. (*Chem. Rev. Fett. Harz. Ind.*, 1913 [2]; *Apoth. Zeit.*, 1913, **28,** 43.) A new oil fruit, named Manketti nuts, is produced by the Euphorbiaceous *Ricinodendron rautenenii*, a native of the plains of S. Africa. The fruit is hard and oval. The seeds are grey with dark mottlings, and are 20 mm. long and 14 mm. broad. They yield

63 per cent. of kernels, containing 51·5 per cent. of oil, having the following characters: Solidifying point, —8 to —10°C.; acid value, 0·94; saponification value, 194·8; iodine value, 134·8; Reichert-Meissl value, 1·24. It is a drying oil allied to poppy seed oil.

Menhaden Oil. (*Southall's Report*, 1913, **21**, 14.) An authentic sample of this fish oil had the following characters: Sp. gr., 0·9314; free fatty acid (as oleic acid), 7·19 per cent; iodine absorbed, 179·3 per cent.; saponification value, 192·0 per cent.; unsaponifiable matter, 1·26 per cent. (crystalline); η_D, 1·4807.

Oils, Fixed, Saponification without Heat. C. N. Watson. (*J. Amer. Pharm. Assoc.*, 1913, **2**, 301.) It is found that heating is unnecessary in the determination of the saponification value of fatty oils with alcoholic $N/_2$ KOH. If the oil and the alcoholic alkali are left in contact for 16 hours, quantitative saponification will be complete.

Olive Oil, Detection of Arachis Oil in. L. Adler. (*Zeits. Untersuch. Nahr. Genussm.*, 1912, **23**, 676.) One c.c. of the oil is pipetted off and heated with 5 c.c. of 8 : 100 KOH solution (KOH 80 Gm.; water 80 Gm.; alcohol 90 per cent. to 1 litre) in a 100 c.c. Erlenmeyer flask for 4 minutes in the boiling water-bath, the flask being fitted to a long tube-condenser, so that loss of EtOH is carefully avoided. When saponification is complete, in about the time named, the product is cooled to about 25°C. and then treated with 1·5 c.c. of acetic acid 33 per cent. and 50 c.c. of 70 per cent. alcohol. After well shaking, if the mixture is not clear, a considerable amount of arachis oil is probably present. It is then warmed until clear, then cooled by dipping into cold water until the temperature reaches 16°C. After further shaking and setting aside for 5 minutes, if no distinct turbidity occurs, it is cooled to 15·5°C., shaken and set aside for another 5 minutes. If still no turbidity appears there is not more than 5 per cent. of arachis oil present. If there should be a turbidity it will remain until the temperature of the liquid rises to 18°C. Adulteration with such amounts of arachis oil as are generally met with will give a distinct turbidity at 16°C. By observing the temperature at which turbidity appears with mixtures of known amounts of the two oils, under the conditions of the above test, an approximate determination may be made of the quantities present in commercial

samples. (See also *Y.B.*, **1907,** 115; **1910,** 100; **1911,** 110; and *Gen. Index.*)

Ox Foot and Sheeps' Foot Oils, Distinctive Reactions of. N. Chercheffsky. (*Les Matières grasses*, 1913, **6,** 3070; *J.S.C.I.*, 1913, **32,** 542.) Twenty Gm. of the oil is dissolved in 5 c.c. of CS_2, and added gradually to 10 Gm. of H_2SO_4 (sp. gr. 1·84). Ox foot oil gives a brownish-red colour, while the liquid remains clear; sheeps' foot oil gives a yellowish-brown colour and a turbidity. Twenty Gm. of the oil is dissolved in 5 c.c. of CS_2, and treated with 10 drops of a solution of $K_2Cr_2O_7$ in strong H_2SO_4. Ox-foot gives a brown colour and sheeps' foot oil a straw yellow colour. A mixture of 10 c.c. of the oil, 10 c.c. of HCl, and 0·1 c.c. of a 2 per cent. alcoholic solution of furfural is shaken for 2 minutes. Ox-foot oil becomes brown and the colour is intensified on heating, whilst sheeps' foot oil remains colourless even when heated.

Pinus Monophylla Nuts, Oil of. M. Adams and A. Holmes. (*J. Ind. and Eng. Chem.*, 1913, **5,** 285.) The seeds of the Pinon Pine, or Grey Pine, also known as *P. fremontiana*, were formerly used by the native Indians as a food. The tree is a native of the Eastern slopes of the Sierra Nevadas. The seed is a pleasant tasting oily nut. By extraction with Et_2O the kernels gave 16·2 per cent. of yellow fluid oil, which gradually bleaches on standing; saponification value, 189·3; Huebl value, 107·9 to 108; $\eta_{D20°}$, 1·4716. It consists chiefly of the glycerides of oleic acid with small amounts of the glycerides of stearic, palmitic, lauric and linolic acids.

Plant Fats, Distillation of, in vacuo. C. Thomae. (*J. prakt. Chem.*, 1913, **87,** 144; *J.S.C.I.*, 1913, **32,** 150.) By direct vacuum distillation of the fat and wax-yielding parts of plants these constituents are obtained in a state of greater purity than by extraction. The peel or outer skin of apples, grapes, peaches, potatoes, lemons, cucumbers, oranges, also rose blooms and yeast, can be treated in this way.

Polygala Butyracea Seeds, Fixed Oil of. (*Bull. Imp. Inst.*, 1913, **11,** 62.) The seeds yielded 37·9 per cent. of soft yellowish fat with a pleasant taste and no marked odour; m.p., 36°C.; sp. gr. 100°C. 0·866 15°C.; and value, 1·24; saponification value, 251; iodine value, 52·5; Hehner value, 85–6; Reichert-Meissl value, 45·6; titer value, 37·85°C. The plant is named "Cheyi"

in Northern Nigeria; it occurs commonly in Tropical West Africa.

Ricenodendron Rautanenii Seeds, Fixed Oil of. (*Gehe's Report: Pharm. Zentralh.*, 1913, **54,** 557.) The seeds of this Euphorbiaceous plant yield about 51 per cent. of oil; congealing at —8 to —10°C.; acid value, 0·94; saponification value, 194·8; iodine value, 134·8; Reichert-Meissl value, 1·24. It is a drying oil, allied to poppy seed oil.

Salvadora Persica Seeds, Fat of. (*Bull. Imp. Inst.*, 1913, **11,** 61.) The bright yellow bitter kernels of the seeds yielded 44·6 per cent. of hard bright yellow fat with a slightly unpleasant odour. Sp. gr., 0·867; acid value, 9·3; saponification value, 245·2; iodine value, 5·9; m.p., 38°; titer value, 30·4°C. The small tree or shrub producing the seeds is a native of the Sudan, where it is known as the "mustard tree." The fat is similar to that obtained from the seeds of *Salvadora oleoides*, as described by Hooper.

Shea Butter, Characters of. (*Rev. Fett. Harz. Ind.*, 1912, 224; *Pharm. Zentralh.*, 1913, **54,** 438.) The fat of the kernels of *Butyrospermum parkii* is largely used as a dietetic article in tropical Africa. Its characters range between the following limits: Sp. gr., 99°/15°C., 0·859 to 0·869; saponification value, 179 to 184; insoluble fatty acids, 91·2 to 96·5 per cent.; unsaponifiable matter, 1·7 to 7·0 per cent.; titer value, 51·8° to 53·2°C.; iodine value, 54 to 62.

Soya Bean Oil, Colour Reaction for. L. Letting. (*Chem. Rev. Fett. Harz.*, 1913, 61; *Pharm. Zentralh.*, 1913, **54,** 522.) On shaking together a mixture of 5 c.c. of soya bean oil, 2 c.c. of $CHCl_3$ and 3 c.c. of a 1 : 50 aqueous solution of uranium nitrate, a distinctly lemon yellow emulsion is obtained. With sesame, cotton seed, nut, rape and maize oil a white emulsion results. Olive oil gives a greenish tint, sometimes also yellowish like that of an oil mixed with a little soya oil. The yellow colour with soya oil is permanent. (See *Y.B.*, **1910,** 103, 276; **1911,** 114; **1912,** 120.)

Wax, Humble Bee. Sundrik. (*Zeits. Physiolog. Chem.*, 1911, **72,** 455; *Pharm. Zentralh.*, 1913, **54,** 511.) Humble bee wax is much more easily saponified by alcoholic KOH than psylla wax. The latter is barely acted on by the KOH until the alcohol

has been evaporated, whereas humble bee wax is markedly attacked. When psylla wax is heated with soda lime psyllaic acid is formed. When the alcohols of humble wax is thus treated the acid obtained melts at 78°C.

Wood Oil, Chinese, Methods of Analysis. W. Hoepfner and H. Burmuster. (*Chem. Zeit.*, 1913, **37**, 19, 39; *J.S.C.I.*, 1913, **32**, 150.) The following figures were obtained from specimens of wood oil believed to be genuine:—

	Max.	Min.	Mean.	No. of samples examined.
Sp. gr. at 15°C.	0·9422	0·9365	—	—
Saponification value	199	189	192	5
Iodine value (Hübl, 18 hrs.)	171	156	164·6	24
Refractive index at 20°C.	1·5202	1·5110	1·5175	24

Tables are given showing the effect upon these constants of the addition to the genuine wood oil of known quantities of likely adulterants such as tea-seed oil and soya bean oil. Determinations of sp. gr. and saponification value are of minor importance, but the iodine value, refractive index and behaviour of the oil in the polymerization test are valuable. The iodine value should be determined by the Hübl method (18 hours), as somewhat unreliable results are stated to have been obtained with the Wijs or Hanûs methods. The refractive index was determined by an Abbé refractometer (as the figure obtained falls outside the Zeiss butyro-refractometer scale). The polymerization test was carried out by Bacon's method, except that the oil be heated for 12 minutes at 310°C.

GLUCOSIDES, SUGARS AND FERMENTS

Aldoses, Separation of, from Ketoses by Means of β-Naphthol-benzylamine. M. Betti. (*Gazz. Chim. Ital.*, 1912, 288; *J. Pharm. Chim.*, 1912, **6**, 223.) Beta-naphthol dextro benzylamine, $\begin{matrix} C_6H_5 \\ C_{10}H_6{\cdot}OH \end{matrix}$ $CH{\cdot}NH_2$ combines readily with aldoses to form definite crystalline compounds, but is entirely inert towards ketoses. The compounds thus formed with the following sugars have the m.p.'s indicated. With mannose, 207–208°C.; with galactose, 206°C.; with glucose, 190°C.; with formose, 135°C.;

with fructose, 95°C. To solution of 0·9 Gm. of glucose and of laevulose in dilute alcohol, a warm alcoholic solution of β-naphthol-d-benzylamine is added, and the mixture, after standing for 24 hours, is allowed to evaporate spontaneously. The crystalline residue is diluted with a little water, thrown on a filter, and washed with a little water. The aqueous solution then contains nearly all the laevulose. The crystals are drained, washed with a little C_6H_6 and purified by recrystallization from EtOH. The glucose may be liberated by treatment with dilute HCl.

Aloins of Natal Aloes. E. Léger. (*J. Pharm. Chim.*, 1912, **6,** 241.) The author has reviewed his previous work on Natal aloes. The existence of two aloins, nataloin and homonataloin, is confirmed, although Klavernesse was unable to find the latter. The formulae are, however, revised; $C_{23}H_{26}O_{10}$ is adopted for nataloin and $C_{22}H_{24}O_{10}$ for homonataloin. The crude aloins, left insoluble by treating Natal aloes with acetone or with EtOH 90 per cent., are dissolved to form a 1 : 10 solution in boiling alcohol 60 per cent. On cooling, the solution is sown and agitated to hasten crystallization: then the aloin and homonataloin are separated by frequent fractional crystallizations from alcohol 60 per cent., in which homonataloin is the less soluble. Homonataloin is barely hydrolysed by dilute H_2SO_4, even after contact for a year. After heating for 6 hours with alcoholic HCl twice, at 6 weeks' interval, and then leaving in contact for another year, a sugar was formed which was identified as dextro-arabinose, similar to the sugar derived from barbaloin. The nataloins contain, therefore, a dioxymethoxy-methylanthraquinone or nataloemodin and dextro-arabinose; they are glucosides derived from that sugar. (See also *Y.B.*, **1905,** 20, 114; **1911,** 117 and *Gen. Index.*)

Alpha-Ethyl Glucoside, Prepared by the Biochemical Method. E. Bourquelot, H. Hérissey and M. Bridel. (*Comptes rend.*, 1913, **156,** 168.) By using the ferment α-glucosidase (obtained by macerating dry washed bottom yeast in toluene water for 16 hours at 33°C.), glucose and alcohol suitably diluted; leaving the mixture in contact for 16 days at the ordinary temperature until reaction had ceased; evaporating the product to dryness and extracting it with anhydrous acetic ether, α-ethyl glucoside was obtained in a crystalline condition, having the α_D + 150°64′ identical with E. Fischer's α-ethyl glucoside, obtained by chemical means. The yield was 33 per

cent. of the glucose used. The reaction proceeds best in liquids containing 65 to 70 per cent. of water by volume.

Alpha-Glucosidase, Destruction of, by Alcohols. E. Bourquelot, H. Hérissey and M. Bridel. (*J. Pharm. Chim.*, 1913, **7**, 233.) The activity of the ferment α-glucosidase is entirely destroyed by contact for 48 hours with methyl alcohol, 80 or even 60 per cent. by volume. With methyl alcohol 40 or 35 per cent. by volume a much slower loss of activity occurs; but even with this dilution it is ultimately complete. This explains why it was found, when synthetizing α-methyl glucoside, that it was necessary to use a relatively dilute alcoholic solution in order to obtain good results. With certain other alcohols, a greater dilution than the above is necessary to preserve the activity of the ferment.

Alpha-Methyl Glucoside, Synthesis of, by Biochemical Method. E. Bourquelot, H. Hérissey and M. Bridel. (*Comptes rend.*, 1913, **156**, 491.) By allowing a mixture of α-glucosidase, glucose, water and methyl alcohol to stand at the normal temperature for 15 days, a good yield of α-methyl glucoside has been obtained, in prismatic colourless needles, m.p. 166°C.; α_D + 156; identical with the product of the chemical method. Contrary to what has been observed with emulsin in the formation of β-alcohol glucosides (see pp. 113–114), it is found that α-glucosidase does not act well if the amount of alcohol exceeds a certain volume. The ferment is absolutely and quickly destroyed by contact with the alcohols in an undiluted state. Even with a strength of 30 per cent. of methyl or ethyl alcohol by volume, action slows down and is ultimately stopped. The above results were obtained with 20 per cent. by volume of the alcohol. In aqueous solution α-methyl glucoside is quickly hydrolysed by α-glucosidase.

Alpha-Propyl Glucoside and Alpha-Allyl Glucoside, Synthesis of, by the Biochemical Method. H. Hérissey and M. Bridel. (*J. Pharm. Chim.*, 1913, **7**, 502, 525.) These two glucosides, which have not been obtained before, were synthetized by action of the ferment of dry bottom-yeast, α-glucosidase, on glucose and the respective alcohols in the presence of water. As in the case of α-ethyl glucoside and α-methyl glucoside, reaction takes place better when the amount of alcohol present in the reaction mixture does not exceed 15 to 20 per cent. α-Propyl

glucoside occurs in odourless, slightly bitter, permanent, soluble, long needles, having the α_D + 140·8°; α-allyl glucoside, α_D + 132° occurs in long, flexible, colourless and odourless, very slender, needles, with a sweetish nauseous taste. Both glucosides, in aqueous solution, are fermented by yeast.

Antiaris Toxicaria Juice, Further Note on. H. Kiliani. (*Berichte*, 1913, **46,** 677.) Both α-antiarin and β-antiarin have the same formula which is now found to be $C_{27}H_{40}O_{10}$. α-Antiarin crystallizes with 4 mols. H_2O, β-antiarin with 3 mols. On hydrolysis, they give the same antiarigen, but β-antiarin gives rhamnose and α-antiarin a new metameric sugar antiarose. Kotake and Knoop have isolated a crystalline albuminoid from the residues after separating the antiarins. This forms hygroscopic acicular crystals, having the formula $(C_{26}H_{50}N_{10}S_2O_{13})_n$. It remains quite white at 200°C. and begins to turn brown at 240°C. (See also *Y.B.*, **1911,** 196, and *Gen. Index.*)

Apocynamarin, New. (*Apoth. Zeit.*, 1913, **28,** 250.) By extracting *Apocynum cannabinum* with suitable solvents, precipitating the extracts with petroleum ether, and purifying the product by recrystallization, a substance has been obtained in colourless prismatic crystals, m.p. 144°C., which is regarded as the active principle of the drug, and has been named new apocynamarin. The new substance is intensely bitter, sparingly soluble in cold water, and very toxic. On the heart, its action resembles that of digitalis, but it is less cumulative than that drug or than strophanthin. The characteristic physiological action of Canadian hemp on the heart muscle is attributed solely to new apocynamarin, and not to any of the amorphous or crystalline products which have been previously recorded as being constituents of *Apocynum*. It occurs in the bark as well as in the rhizome of *A. cannabinum*, and has also been found in *A. androsaemifolium* and *A. venetum*. By boiling with 1 : 100 acetic acid it is converted into the previously known apocynamarin. New apocynamarin should prove of therapeutic value, since the toxic dose is considerably higher than that necessary to obtain its full therapeutic value. In this respect it is claimed to be superior to strophanthin. The fact that it does not possess the cumulative action of digitalis is also in its favour. The dose, *per os*, is 0·3 to 1 Mgm. several times in 24 hours; by hypodermic injection, 0·5 to 1 Mgm. (See also *Y.B.*, **1908,** 20; **1909,** 9; **1911,** 238.)

Arbutin and its Synthesis. C. Mannich. (*Archiv. Pharm.*, 1912, **250,** 547.) Commercial arbutin contains from 5 to 40 per cent. of methyl-arbutin and its m.p. ranges from 135° to 192°C., according to the amount of this impurity present. Tyrolese bearberry leaves yield a mixture of arbutin 3 and methyl arbutin 1. The arbutin from Spanish bearberry leaves contains only 5 per cent. of methyl arbutin. Arbutin is separated from methyl arbutin by means of hexamethylene tetramine with which arbutin forms a crystalline compound. A method for the synthesis of arbutin from acetobromoglucose and hydroquinone is described. (See also *Y.B.*, **1908,** 21, 22; **1909,** 10; **1910,** 105; **1911,** 117, 118, 124; **1912,** 122.)

Beta-Benzyl Glucoside Synthetized by the Biochemical Method. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1912, **6,** 298.) β-Benzyl glucoside $C_6H_{11}O_5C_7H_7$ has been synthetized by the action of emulsin, at the normal temperature on a mixture of benzyl alcohol, water, and glucose. It occurs in fine, odourless stable needles, with a nauseous, persistent, bitter taste; α_D —49°78′; m.p., 105°C. The aqueous solution is hydrolysed by emulsin.

Beta-Butyl Glucoside, β-Isobutyl and β-Allyl Glucosides Prepared by the Biochemical Method. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1912, **6,** 193.) These three β-glucosides have been obtained by the biochemical method, by the action of emulsin on mixtures of glucose and the respective alcohols, with a minimum of water. β-Butyl glucoside forms colourless, bitter, very hygroscopic needles; very soluble in water and in alcohol; α_D —35°4′. It slightly reduces Fehling's reagent, possibly because not quite pure. Its aqueous solution is rapidly hydrolysed by emulsin. β-Isobutyl glucoside also occurs in needles, which are very bitter; it is not hygroscopic; m.p., 99–100°C.; very soluble in water and in EtOH; α_D —34°96′. β-Allyln-glucoside forms hygroscopic needles which are less bitter than the above; m.p., 97°C.; α_D —40°34′.

Beta-Ethyl Galactoside, Obtained by the Biochemical Method. E. Bourquelot and H. Hérissey. (*J. Pharm. Chim.*, 1912, **6,** 385.) Emulsin of almonds is a compound ferment and contains, among others, lactase. The authors have been able by means of it to prepare β-ethyl galactoside by leaving pure galactose in solution in alcohol 79 to 80 per cent. in contact

with emulsin. It forms fine, colourless, odourless needles with a sweetish and slightly bitter taste ; m.p., 123–125°C. ; very soluble in water and in EtOH ; α_D —4° ; it does not reduce Fehling's reagent. Kephir ferment also acts in the same manner, synthetizing the β-glucoside. As in the case of β-ethyl glucoside HCl in EtOH solution converts β-ethyl galactoside into its stereoisomer α-ethyl galactoside. This method opens up the way for obtaining a whole series of β-galactosides of alcohols.

Beta-Ethyl Glucoside, Formation of, by Emulsin. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1912, **6,** 13, 97.) When emulsin was brought into contact with saligenin and glucose, in presence of alcohol, in an experiment attempting to synthetize salicin, it was found that a glucoside was formed which was not salicin, but which was identified as β-ethyl glucoside. Subsequent experiments showed that when glucose and alcohol 85 per cent. are left in contact with emulsin at the ordinary temperature β-ethyl glucoside is formed. Moreover, this is free from any of the stereoisomer, α-ethyl glucoside, such as is formed when the β-glucoside is prepared by chemical methods. Pure β-ethyl glucoside forms masses of felted needles ; m.p., 73°C. ; α_D —33·38°. When, therefore, emulsin is allowed to act on a glucoside in an alcoholic medium, this glucoside is first hydrolysed ; the glucose thus set at liberty combines, under the influence of the same ferment, with the alcohol, to form β-alcohol glucoside. (See also *Y.B.*, **1912,** 125, 130.)

Beta-Geranyl Glucoside, β-Cinnamyl Glucoside, and β-Phenylethyl Glucoside, Synthesis of, by the Biochemical Method. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1913, **7,** 179.) By the action of emulsin on glucose and the respective alcohols, the three corresponding glucosides have been obtained synthetically. All are odourless liquids, but when hydrolysed by emulsin in presence of water they regenerate the odorous alcohols. (See also p. 142.)

Beta-Iso-Propyl Glucoside and β-Iso-Amyl Glucoside. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1912, **6,** 442.) These two glucosides have been prepared by the action of emulsin on mixtures of the respective alcohols, glucose and water. β-Iso-propyl glucoside forms colourless, bitter needles, less hygroscopic than those of β-propyl glucoside ;

m.p., 123–125°C. (corr.); α_D —36·3°. β-Iso-amyl glucoside forms permanent acicular crystals; m.p., 99–100°C.; α_D —36°40′.

Beta-Methyl Galactoside and β-Allyl Galactoside, Synthesis of, by the Biological Method. E. Bourquelot and M. Bridel. (*Comptes rend.*, 1913, **156**, 1104.) *Beta-methyl galactoside* has been obtained by the action of emulsin on a 1 : 100 solution of galactose in MeOH 85 per cent. The only difficulty met with was the removal of the excess of galactose when the synthesis was complete. This was effected, adding a little glucose and fermenting the mixture with bottom yeast. This destroyed the sugars, but left the β-methyl galactoside intact. It was then isolated as fine, colourless, sweetish needles; m.p., 178°C.; $\alpha_{D\ +0°}$. It does not reduce Fehling's solution and is slowly hydrolysed, in aqueous solution, by emulsin. It agrees with the chemically prepared galactoside of E. Fischer. *Beta-allyl galactoside*, prepared in an analogous manner, with allyl alcohol, forms tufted needles with a faint, bitter taste; α_D —12°5′; it does not reduce Fehling's solution, but is slowly hydrolysed in aqueous solution, by emulsin, with the production of the characteristic odour of allyl alcohol.

Beta-Methyl Glucoside, Formation of, by Emulsin from Methyl Alcohol and Glucose. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1912, **6**, 56.) When emulsin is left in contact with glucose and methyl alcohol containing some water, β-methyl glucoside is formed in a precisely similar manner to that in which β-ethyl glucoside is formed under similar conditions. The best yields are obtained with methyl alcohol containing 15 per cent. of water. When a glucoside in solution in MeOH is brought into contact with emulsin, this is first decomposed, and then with the glucose thus set free β-methyl glucoside is formed. Pure β-methyl glucoside crystallizes in quadratic scales, which at first taste sweetish, then bitter; m.p., 102–104°C.; α_D —32·06°.

Beta-Methyl Glucoside, Influence of, on Synthetizing Action of Emulsin. E. Bourquelot and E. Verdon. (*Comptes rend.*, 1913, **156**, 1638.) Investigations show that varying proportions of glucose do not affect the results obtained in synthetizing β-methyl glucoside with emulsin and MeOH 70 per cent. The amount of the glucoside formed, however, has a marked

effect. When this reaches a certain point further synthesis is inhibited.

Beta-Methyl Glucoside, Synthesis of, by the Biochemical Method in Presence of a Neutral Inert Liquid. E. Bourquelot and E. Verdon. (*J. Pharm. Chim.*, 1913, **7,** 482.) It is found that emulsin will form β-methyl glucoside from MeOH and glucose, in a vehicle of acetone, provided either the MeOH or the acetone contain a little water. If both liquids are anhydrous, no reaction takes place. By means of acetone containing a small amount of water, it will therefore be possible to obtain glucosides of solid alcohols which are insoluble in water. In all experiments with acetone in this direction it is most important to ensure that the solvent is free from MeOH. This is a frequent impurity in commercial acetone, even in such as is sold as " pure " from bisulphite. With such impure acetone β-methyl glucoside is formed which vitiates the results.

Beta-Phenyl-Ethyl Glucoside and β-Cinnamyl Glucoside, Formation of, by Emulsin. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1913, **7,** 335.) Phenyl-ethyl alcohol is a natural constituent of certain essential oils. It is possible that it may exist in plant tissues in the form of a glucoside. The following experiments prove that its β-glucoside may be obtained by the action of emulsin on phenyl-ethyl alcohol and glucose at the normal temperature, in the presence of a little water. The glucoside thus obtained, $C_6H_{11}O_{65}CH_2C_6H_5$, occurs in colourless, odourless, distinctly bitter crystals ; very soluble in acetic ether and in water ; α_D about $-29°$ when pure. Its aqueous solution is hydrolysed by emulsin, when it acquires a rose-like odour of the free alcohol.

β-Cinnamyl glucoside, obtained in a similar manner, but at temperature of 33°C., also forms colourless, odourless needles ; α_D $-16°46'$. Its aqueous solutions are hydrolysed by emulsin, when they acquire the hyacinth-like odour of cinnamyl alcohol.

Beta-Propyl Galactoside and β-Benzyl Galactoside, Synthesis of, by the Biological Method. E. Bourquelot, H. Hérissey and M. Bridel. *Comptes rend.*, 1913, **156,** 330.) These two alcohol glucosides, not hitherto described, have been obtained by the contact of the alcohols, with a little water, emulsin of almonds, and galactose at the ordinary temperature. *β-Pro-*

pyl galactoside occurs in long, white, permanent, odourless, slightly bitter crystals, very soluble in water and in EtOH.; m.p., 105–106°C. (corr.); α_D −8°86′; the aqueous solution slightly reduces Fehling's reagent, and is hydrolysed by emulsin. *β-Benzyl galactoside* also forms long, white, odourless crystals, with a bitter, nauseous taste; m.p., after drying over H_2SO_4, 100–101°C.; the cold fused mass does not re-melt below 119–120°C.; α_D — 25°05′. It is completely hydrolysed by dilute H_2SO_4 at 100°C. in 2 hours, also, in aqueous solution, by emulsin.

Beta-Propyl Glucoside, Synthesis of, by Means of Emulsin. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1913, **6**, 88.) Precisely as in the case of ethyl and methyl alcohols, propyl alcohol and glucose in contact with emulsin slowly form β-propyl glucoside. This is the first time that this glucoside has been obtained. It crystallizes from acetic ether in aggregated clustered needles with a distinctly bitter taste; m.p., 95–97°C.; α_D — 34°39′.

Beta-Salicyl Glucoside, Synthesis of, by Emulsin. E. Bourquelot and H. Hérissey. (*Comptes rend.*, 1913, **156**, 1790.) By leaving saligenin and glucose in contact with emulsin, in a medium of acetone and a small quantity of water, synthesis slowly takes place, and the glucoside formed is identified as β-salicyl glucoside, $C_{13}H_{18}O_7$. It occurs in long, fine, odourless, bitter needles, barely soluble in water. The m.p. varies with the rapidity of heating: when slowly warmed it begins to soften between 50–60°C., then melts to a viscous, glassy mass which gradually loses weight, equivalent to 4 mols. H_2O, so that the formula for the crystals is $C_{13}H_{18}O_7 + 4H_2O$. Even after being kept for some hours at 120°C., the anhydrous mass at once crystallizes on contact with a little water. The glucoside reduces Fehling's reagent: its reduction equivalent is one-third that of glucose. When free from all trace of saligenin the aqueous solution gives a bright but not very deep violet colour with Fe_2Cl_6. The α_D is — 37°5′.

Diastase, Pure, Preparation and Properties of. Ernst Pribram. (*Biochem. Z.*, **44**, 293; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7**, 94.) Malt is fermented with yeast in the presence of $CaCO_3$, which neutralizes lactic acid in case acid fermentation accompanies the alcoholic. After the sugar has all been fermented the solution is concentrated *in vacuo* until

calcium lactate crystallizes. The enzyme solution is separated from the crystals by filtration with suction. The solution contains a peptide-like substance with 7–8 per cent. of N. It also contains a substance which, after hydrolysis with dilute H_2SO_4, gives the α-naphthol and resorcinol reactions, although it yields neither hydrazone nor osazone. The enzyme could not be separated into two constituents by ultrafiltration. It acts only in the presence of a slight amount of acid.

Digitalis Glucosides. (*Merck's Report*, **1911,** 25; *Amer. J. Pharm.*, 1913, **85,** 26.) A reprint from the first source of a valuable compilation of the nomenclature, history and general bibliography of the digitalis glucosides.

Digitalis, Simple Colorimetric Test for the Approximate Valuation of. W. H. Martindale. (*Pharm. J.*, 1912 [4], **35,** 745, 778.) After fully dealing with the chemical investigations of previous workers, and the methods of physiological assay, the following method is given to determine whether a tincture is up to physiological test requirements (usually taken at M.L.D. = 0·75 c.c. per 100 Gm. body weight of frog). Mix 10 c.c. of the tincture with 10 c.c. of water, precipitate with 10 per cent. neutral lead acetate solution (about 3 c.c.), adding a little kieselguhr. Allow to stand for 15 minutes, filter off on the pump, wash the precipitate slightly. Remove excess of lead from the filtrate with 10 per cent. Na_2HPO_4 solution (about 2 c.c. required) and filter. Add a little $CaCO_3$ (about 0·2 Gm.) to the filtrate, and evaporate to dryness on a water-bath. Add about 2 Gm. of dry washed sand to the residue and extract with $CHCl_3$ five times by thorough trituration, using about 10 c.c. on each occasion. Filter and evaporate the $CHCl_3$ solution and extract the residue with warm water on the water-bath, using 10 c.c. and 5 c.c. and again employing sand. Filter, evaporate to dryness in a porcelain basin, extract the residue again with cold $CHCl_3$ to purify it (about three or four quantities of 5 c.c. each, using dry sand and triturating thoroughly with a small pestle) and filter. Evaporate the combined $CHCl_3$ liquors and dissolve the residue in 4 c.c. of glacial acetic acid. Mix 0·1 c.c. of this acetic solution with 1 c.c. of sulphuric ammonium molybdate reagent in a 5 × 1 cm. test tube and compare the depth of colour after five minutes with the scale—this coloration indicates the content of combined "active water soluble" glucosides. Further, if 0·1 c.c.

of the acetic solution be mixed with 0·5 c.c. of glacial acetic acid, and this be layered upon 1 c.c. of the sulphuric ammonium molybdate reagent, the typical blue ring showing presence of digitoxin should be formed.

The colour scale is an arbitrary one devised by the author. In this "below standard" (No. 0), standard (No. 1), above standard (No. 2 and No. 3), correspond respectively to M.L.D. of 0·9 c.c., 0·75 c.c., 0·6 to 0·5 c.c., and 0·4 to 0·3 c.c.

Digitonin, New Distinctive Micro-reaction for. C. Reichard. (*Pharm. Zentralh.*, 1913, **54,** 221.) A drop of strong $Co2NO_3$ is evaporated with gentle heat on a slide until it leaves a deep blue residue. A small particle of dry digitonin is placed thereon, with a little glacial acetic acid, and the whole is rubbed together, more acid being added when necessary. The mixture is then set aside: it is hygroscopic and gradually acquires a red colour. In 24 to 36 hours after being exposed to the air the moist mass shows well formed six-angled pink crystals, resembling under the lens the outline of the conventional benzene ring. Under similar conditions digitoxin does not give any red crystals, but forms at once a permanent moist yellowish green mass. A reagent of $Co2NO_3$ in glacial acetic acid serves at once to distinguish between the two glucosides.

Emulsin, Action of Heat on, in Alcohol of Different Strength. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1913, **7,** 27.) In the weaker alcohols, from 10 to 50 per cent., in which it is not precipitated, emulsin loses its activity at a lower temperature in the stronger alcohol than in the weaker. Thus, in alcohol 50 per cent. the activity is destroyed at 55° to 60°C., whereas in alcohol 10 per cent. the critical temperature is 65° to 70°C. In stronger alcohols 60 to 95 per cent., in which the ferment is precipitated, the resistance to the destructive influence of heat seems to be increased with the strength of the alcohol, due probably to its physical condition. Thus, the action is destroyed in alcohol 60 per cent. between 55°–60°C., whereas in alcohol 95 per cent. the temperature of 65° to 70°C. is necessary for its destruction. It is obviously important, in the case of experiments on synthesis by means of emulsin, to operate at temperatures below that at which only a slight destructive action is evident. Since these experiments are prolonged over many days, a destructive action which may be trivial in

the course of a few minutes might become total in the longer period.

Emulsin, Influence of Heat on, in Presence of Alcohol. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1913, **7,** 65.) Emulsin is more rapidly destroyed by boiling EtOH 60 per cent. than by media of higher alcoholic strength. Consequently, to destroy this ferment, it is better to treat fresh plant tissues with boiling EtOH 95 per cent., since the moisture in the tissues under the ordinary conditions of the biological method will reduce the alcoholic strength of the medium to about 60 per cent. In the case of dried herbs and seeds, the EtOH used should not exceed 80 per cent. If absolute EtOH is employed a much longer boiling is requisite to destroy the ferment.

Enzymes, Emulsin-like. Ed. Schaer. (*Centr. Bakt. Parasitenk., II Abt.*, **35,** 483; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 797.) The splitting of amygdalin by emulsin producing from 1 mol. of amygdalin, 1 mol. HCN, 1 mol. C_6H_5CHO, and 2 mols. glucose, is not direct but occurs in three stages. Each of the three stages is occasioned by the influence of a special enzyme which is a constituent of the complex emulsin. The three stages are: (1) *amygdalase* liberates from the amygdalin complex 1 mol. of glucose; (2) *β-glucosidase* hydrolyses the amygdalic nitrile glucoside into amygdalic nitrile (that is to *d*-benzaldehydecyanohydrin) and glucose; (3) *δ, d-oxynitrilase* decomposes the above cyanohydrin into benzaldehyde and HCN. (4) Besides the above three enzymes emulsin contains an "*o-d-oxynitrilase*," that is a synthetic acting oxynitrilase. It combines HCN and C_6H_5CHO to *d*-benzaldehydecyanohydrin. Of the many plants (including cryptogams) examined, only the seeds of Rosaceae (*Cydonia, Pyrus, Prunus, Erobotrya*) contained the four enzymes of ordinary emulsin. Otherwise one or the other is lacking, for instance in bay leaves and elderberry leaves the amygdalin-splitting enzyme was absent. Emulsin occurred in *Polyporus sulfureus* and in *Claviceps purpurea.*

Enzymes of the Emulsin Type, Distribution of, in Plants. L. Rosenthaler. (*Archiv. der Pharm.*, 1913, **251,** 56, 85.) Amygdalin is hydrolysed by preparations of the ferments from the parts named of the following plants: Seeds of *Ricinus communis, Cydonia vulgaris, Eryobotrya japonica, Pyrus malus, P. communis, Prunus amygdalus,* var. *amara* and all the

other species of *Prunus* examined, *Phaseolus lunatus*, *Physostigma venenosum*, *Vicia sativa*, *Cucurbita pepo*. Fruits of *Cannabis sativa*, *Fœniculum vulgare*, *Carum carvi*, *Anethum graveolens*, *Conium maculatum*, *Œnanthe phellandrium*, *Petroselinum sativum*, *Sorbus aucuparia*, *Dolichos lablab*, also fruit stalks of *Prunus cerasus*. Flowers of *Prunus spinosa*, *Cratægus oxyacantha*, *Achillea millefolium*, *Matricaria chamomilla*, also stigmata of *Zea mays*. Leaves and herb: *Fumaria officinalis*, *Taraktogenos blumei*, *Sambucus nigra*, *Aquilegia vulgaris*. Bark: *Prunus padus*. Subterranean organs: *Sambucus ebulus*. Seeds: *Linum usitatissimum*. Sclerotium: *Secale cornutum*. Decomposition of amygdalin did not occur in the preparations but hydrolysis occurred with the material itself in the following drugs. Seeds: *Strophanthus kombé*, *S. hispidus*, *Sinapis alba*. Fruits: *Pimpinella anisum*, *Coriandrum sativum*. Flowers: *Lamium album*. Leaves and herb: *Juglans regia*, *Rubus idæus*, *Prunus laurocerasus*, *Pulmonaria officinalis*, *Atropa belladonna*. Subterranean organs: *Arum maculatum*, *Triticum repens*. Fruit bodies: *Polyporus sulfureus*. Synthesis of cyanhydrin was effected with preparations from the following material. Seeds: *Pangium edule*, *Hydnocarpus wightiana*, *Cydonia vulgaris*, *Eriobotrya japonica*, *Pyrus malus*, *P. communis*, *Prunus amygdalus*, Stokes var. *amara*, *Prunus Armeniaca*, *P.A.* var. *dulcis*, *P. avium*, *P. domestica*, and *P. persica*. Fruits: *Coriandrum sativum*, *Sorbus aucuparia*. Flowers: *Prunus spinosa*, *Cratægus oxyacantha*, *Achillea millefolium*. Stigmata: *Zea mays*, L. Leaves and herb: *Taraktogenos blumei*, *Prunus laurocerasus*, *Sambucus nigra*. Bark: *Prunus padus*, *P. virginiana*. Subterranean organs: *Sambucus ebulus*. Decomposition of nitrile occurred with preparations of the following material. Seeds: *Pangium edule*, *Hydnocarpus wightiana*, with all the *Pomaceæ* and *Prunaceæ* examined previously. Fruits: *Fœniculum vulgare*, *Pimpinella anisum*, *Coriandrum sativum*, *Cuminum cyminum*, *Anethum graveolens*, *Petroselinum sativum*, *Sorbus aucuparia*. Flowers: *Prunus spinosa*, *Cratægus oxyacantha*, *Achillea millefolium*. Leaves and herb: *Prunus laurocerasus*, *Aquilegia vulgaris*. Bark: *Prunus padus*, *P. virginiana*.

The author thus summarizes the steps which probably occur in the reactions of these enzymes. (1) Amygdalin, by the action of amygdalase, affords mandelonitrile glucoside and glucose. (2) Mandelonitrile glucoside is resolved by the action of prunase

into *d*-benzaldehyde cyanohydrin and glucose. (3) *d*-benzaldehyde cyanohydrin is resolved by *d*-oxynitrilase into benzaldehyde and hydrocyanic acid. (4) Benzaldehyde and hydrocyanic acid unite under the influence of a *d*-oxynitrilase to form *d*-benzaldehydecyanohydrin. (5) In addition, benzaldehyde and hydrocyanic acid afford inactive benzaldehyde cyanohydrin. (6) Inactive benzaldehyde cyanohydrin is capable of being split up asymmetrically by *d*-oxynitrilase, giving rise to *l*-benzaldehyde cyanohydrin. But in emulsin-preparations which are rich in this enzyme it is possible that, as a result, the benzaldehyde cyanohydrin which is formed in the process of the decomposition of amygdalin may be laevorotatory.

Gentiana Acaulis, New Glucoside from. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1911, **7,** 179.) A new laevorotatory glucoside, α_D —63°75, not hydrolysed by emulsin, has been found in *Gentiana acaulis*. It has been named *gentiacaulin*.

Gentiana Asclepiadea, Gentiopicrin in. M. Bridel. (*Comptes rend.*, 1912, **155,** 1164.) The roots of the plant, gathered in August, when the flowers are just expanding, contain gentiopicrin, gentianose and saccharose, and probably another carbohydrate which is hydrolysed by invertin. This is the first time that gentianose has been found in any plant except *Gentiana lutea*. (See also *Y.B.*, **1906,** 35, 38 ; **1910,** 108 ; **1911,** 120.)

Gentiana Cruciata, Gentiopicrin and Gentianose in. M. Bridel. (*Journ. Pharm. Chim.*, 1913, **7,** 392.) Like *Gentiana lutea*, *G. asclepiadea* and *G. punctata*, the fresh roots of *G. cruciata* contain gentiopicrin and gentianose. The former in the fresh material examined was present to the extent of 1·35 per cent. (See also *Y.B.*, **1906,** 35 ; **1910,** 108 ; **1911,** 120.)

Gentiana Punctata, Presence of Gentiopicrin in. M. Bridel. (*Comptes rend.*, 1913, **156,** 627.) Like *Gentiana lutea*, its congener *G. punctata* contains in its fresh roots, gentiopicrin, gentianose and saccharose.

Gentiopicrin, Presence of, in the Aerial Stems of Certain Gentians. M. Bridel. (*J. Pharm. Chim.*, 1913, **7,** 486.) Gentiopicrin is present in the leaf-bearing stems of *Gentiana lutea*, of *G. asclepiadea*, and of *G. cruciata*. *G. lutea* and *G. asclepiadea* give from 0·3 to 0·4 per cent. of the glucoside ; *G. cruciata*, how-

ever, contains only a very little gentiopicrin in its leaf stems. These closely resemble those of *G. pneumonanthe* in their chemical constituents. The occurrence of gentiopicrin in the leafy portions of *Chlora perfoliata* and of *Swertzia perennis* has been recorded previously. (See also *Y.B.*, **1911,** 120.)

Glucogallic Acid and Tannin from Aleppo Galls. K. Feist. (*Archiv. Pharm.*, 1912, **250,** 668.) Glucogallic acid was obtained by extracting powdered Aleppo galls, in a Soxhlet, first with pure $CHCl_3$, then with C_6H_6, finally with Et_2O purified over Na. The extract thus obtained, dissolved in a little acetone, was exposed to the vapour of $CHCl_3$, when glucogallic acid crystallized out. Tannin from oak galls treated in a similar manner yields the same product. Glucogallic acid has the formula $C_{13}H_{14}O_9$; m.p., 233°C.; α_D + 10·6° in acetone, at 17°C. It is a monobasic acid, and when hydrolysed gives 40 per cent. of gallic acid, and 35·5 per cent. of dextrose. The residue left, after treating the above extract with Et_2O to remove the glucogallic acid, is tannin. This has the α_D + 28·6 in acetone. It gives 80·7 per cent. of gallic acid and 9·1 per cent. of dextrose when hydrolysed with H_2SO_4.

Glucosides, Commercial, Therapeutically Active. G. Cohn. (*Pharm. Zentralh.*, 1913, **54,** 572.) TANNIN AND ITS COMPOUNDS. —After describing the properties and medicinal uses of tannin, the author deals with the following tannin compounds. *Bismuth subtannate*, $\begin{matrix}HO\\HO\end{matrix}\!\!>Bi\text{-}O\text{-}C_{14}H_9O_8$ is obtained treating BiO NO_3H_2O, 12, with AmOH, sp. gr. 960, 10, and water, 15. After standing in contact for 5 or 6 hours the Bi_2O_3 is collected, washed and mixed with tannin, 15, dissolved in water, 15, and evaporated to dryness on the water-bath. Also obtained by precipitating $Bi3NO_3$ with sodium tannate. It is a yellow, odourless and tasteless, insoluble powder. Dose, from 8 to 30 grains several times a day, for diarrhœa. *Bismuth bitannate.* HO $Bi(O\cdot C_{14}H_9O_8)_2$ is obtained by precipitating a solution of tannin 854 Gm. and NaOH 340 Gm. in 4 litres of water, with a solution of $Bi3NO_3$, 322 Gm., and HNO_3, 52 Gm., in water 350. The bismuth solution is poured into the tannin slowly, and the mixture is stirred for 6 hours. After washing, the precipitate is dried at 40°C. It is a pale yellow, slightly acid, bitter powder. It contains 24·7 per cent. of Bi_2O_3 when dried at 110°C. It is also obtained precipitating a cold solution of tannin in water

with a solution of $Bi3NO_3$ dissolved in acetic acid. It is claimed to be more active than the subtannate. The dose is 8 grains several times a day. Given for intestinal catarrh and for diarrhœa. *Bismuth oxyiodotannate*, known by the name *Idit*, the subject of a German patent, is said to be a mixture of compounds differing in the amount of iodine they contain. The method of preparation and the chemical formulae of these is given. The product is an odourless, harmless antiseptic. *Bismuth dilacto-monotannate*, or *Lactanin*, $C_{20}H_{19}D_{15}Bi$, is a French patented double salt, the method of preparing which is given. Lactanin is a yellow, insoluble, odourless and tasteless powder, given as an intestinal astringent chiefly for chronic enteritis and tuberculous affections of children. *Mercury tannate*, the preparation of which is described, is used as a mild mercurial for the treatment of syphilis. *Lead tannate*, obtained by precipitating lead acetate with tannin and drying at 30° C., is a yellowish grey powder employed in ointment form for burns and other wounds. *Zinc tannate*, known as "*Sel de Barnit*," is obtained by treating ZnO, 10, in water, 15, with tannin, 50, in alcohol 45 per cent., 100. The powder is dried at a gentle heat. It is a yellowish, odourless, barely astringent tasting powder, insoluble in water. A mild astringent used for ophthalmic applications and for decubitus and other skin lesions. *Iron tannate*, obtained by precipitating a solution of ferric acetate with tannin. A black, tasteless powder, containing from 13 to 14 per cent. of Fe. *Aluminium tannate, Tannal insolubile*, $Al_2(OH)_4(C_{14}H_9O_9)_2 + 10H_2O$, is obtained by precipitating a solution of Al_23SO_4 with tannin. It is a brownish, insoluble powder, prescribed as an astringent for chronic catarrh of the respiratory organs. *Aluminium borotannate, Cutol.* A solution of tannin, 1, and borax, 4, in water, 80, is, poured with constant stirring into a solution of aluminium sulphate, 3, in water, 12. The precipitate dried at a gentle heat forms a disinfectant astringent. Used for gonorrhœa, eczema and other skin diseases. *Aluminium tannotartrate, Tannal solubile*, $Al_2(C_4H_4O_6)_2(C_{14}H_9O_9)_2 + 6H_2O$. Basic aluminium tannate, 1 mol., is dissolved in aqueous solution of tartaric acid, 2 mols., and evaporated to dryness. It forms yellowish white, very soluble scales, or powder. Used as a dusting powder in rhinolaryngeal affections or as a paint, when dissolved in glycerin, also as a gargle. *Aluminium borotannotartrate, Cutol solubile.* Aluminium borate is dissolved in tannin and tartaric acid. Used as a dusting powder, ointment, or

plaster mull for skin diseases. *Tannochrom* is a resorcinol chromotannin preparation used as an antiseptic application. *Hexamethylenetetramine tannate; Tannopin; Tannon*, $C_6H_{12}N_4(C_{14}H_{10}O_9)_3$. This is the subject of a German patent, the process for which is described. Tannopin is a styptic and intestinal antiseptic. Dose for adults, 16 grains three or four times a day; for children, 3 to 8 grains. *Orexine tannate; Oxexin*, occurs in commerce as a yellowish white, odourless and tasteless, insoluble powder, given to improve the appetite in doses of 4 to 8 grains in cachets or tablets. *Quinine tannate* is described and its method of preparation given. It should contain at least 33 per cent. of alkaloid. Given in doses of 1½ to 3 grains to children several times daily, for whooping cough; also as a remedy for tuberculous night sweats, in doses of 2 to 8 grains three times a day. Used in pomade as a remedy for falling hair. *Euquinine tannate* is similar to the above and contains 33 per cent. of the base. *Quinoidine tannate* is the tannate of the cinchona amorphous alkaloids obtained by precipitating the HCl solutions of these with tannin. Employed as a stomachic and antithermic. *Quinine ditannate.* Quinine sulphate, 100, is dissolved in boiling water, 3,000, and mixed with a cold solution of tannin, 180, in water, 1,400, then AmOH 1 : 10, 40, diluted to 360 with water, is added. The precipitate is collected, washed and dried. A whitish powder insoluble in water and in Et_2O, containing 33·3 per cent. of alkaloid. Dose, for children, 1½ to 3 grains several times daily; for adults, 3 to 12 grains twice a day. Given for diarrhœa, nephritis and albuminuria. *Cinchonidine ditannate*, prepared in a similar manner, is also used. *Chelidonine tannate*, a yellowish white powder, has been employed as a mild narcotic for children in doses of 1 to 3 grains. *Pelletierine (Punicine) tannate*, obtained by precipitating pelletierine sulphate with tannin, is a yellowish white, astringent powder. The commercial article consists of the tannates of the total alkaloids of pomegranate bark. Soluble in about 700 of water and in 80 of EtOH 90 per cent. Given as an anthelmintic for tapeworm in doses of 8 to 24 grains, after 24 hours' fasting. *Strychnine tannate*, $C_{21}H_{22}N_2O_2$, is insoluble in water. The base does not precipitate with gallic acid, therefore it has been recommended for the determination of tannin. An evident precipitate is obtained with a dilution of 1 of strychnine in 10,000 of water.

FORMALDEHYDE TANNIN COMPOUNDS — *Methylene-ditannin;*

Tannoform. The method of preparation of this patented antiseptic astringent is given. Dose, from 4 to 16 grains for intestinal disturbances. *Methylene-ditannin carbamide*; *Rexotan*, $C_{14}H_9O_9 \cdot CH_2 \cdot NH \cdot COH$, a urea compound. Obtained by adding formaldehyde solution, 40 per cent., 32, to a solution of tannin, 32, urea, 6, in water, 200, and setting aside for 4 or 5 days. The process may be hastened by adding HCl, or H_2SO_4, 1 : 4, 30. The reaction-product separates as a resinous mass which is powdered, warmed and dried. It then forms a light, yellowish powder, readily soluble in alkalies, insoluble in organic solvents. Given for intestinal catarrh. *Methylene-tannin-urethane*, $C_{14}H_9O_9 \cdot CH_2 \cdot NH \cdot COO \cdot C_2H_5$, obtained by treating a solution of tannin and urethane with formaldehyde solution and HCl or H_2SO_4, is the subject of a German patent. *Methylene bromotannin urea; Bromotan*, the patented process for preparing which is given, is introduced for treatment of eczema and for application to fistulæ. *Methylenetannin thiourea*, $C_{16}H_{11}O_9N_2S$, *Methylenetannin thiosinamine* and *methylenetannin methyl* (*ethyl*) *thiourea* have also been patented; also *methylenetannin formamide* and *methylenetannin acetamide*. *Tannoguaioform* is a compound of tannin and guaiacol obtained with formaldehyde. *Tannocresoform* and similar compounds with eugenol and pyrogalloldimethyl ether have been prepared. *Tannothymol* is a condensation product of tannin with thymol, also obtained by means of formaldehyde. It is a reddish, odourless, almost tasteless powder. A whole series of similar compounds of tannin with phenols has been patented. *Tannophenol methane* is a light, whitish powder, soluble in alkalies, insoluble in alcohol. *Bromotannophenol methane* and similar compounds of orthocresol, thymol and β-naphthol have been introduced as antiseptics. *Methylenecotoine-tannin* is obtained by treating a solution of cotoine, and tannin in acetic acid has also been patented for medicinal use as a styptic. *Formaldehyde hydrobromotannin; Tanno-bromin*, is obtained by treating an alcoholic solution of tannin with Br and then adding formaldehyde, separating the reaction product with HCl. It is introduced as a substitute for alkali bromides.

Glucosides, Commercial, Therapeutically Active. G. Cohn. (*Pharm. Zentralh.*, 1913, **54**, 543.) APERIENTS.—*Cathartinic acid*, $C_{30}H_{36}O_5N(?)$, is the active principle of senna (*Cassia angustifolia* and *C. acutifolia*. The drug may be separated

into oxymethylanthraquinones, chrysophanic acid and emodin. Cathartinic acid is a dark-coloured amorphous powder, readily soluble in dilute EtOH and in water, insoluble in absolute EtOH and in Et_2O. On hydrolysis it gives cathartogeninic acid and sugar. The dose as a laxative for adults is 4 to 6 grains; for children 1½ to 3 grains. *Anthraglycosennin* of Tschirch is a brown powder, composed of the glucosides of senna and of their decomposition products.

Rhubarb glucosides are not yet obtained pure in commerce. Chrysophanic acid, emodin, rhein, tetraoxymethylanthraquinone, and rheochrysin, trioxymethylanthraquinone, are the decomposition products of the anthraglucosides to which the drug owes its action. *R. rhaponticum* contains rhaponticin, an anthraglucoside. *Anthraglycorhein* is a mixture of glucosides and their decomposition products. *Frangula-glucosides* are very similar to the rhubarb glucosides. The bark contains as much as 4·5 to 5 per cent. of oxymethylanthraquinones. The main constituent is *frangulin*; in yellow needles, m.p. 228–230°C. By hydrolysis this yields emodin and rhamnose. *Anthraglycorhamnin* is a mixture of glucosides and decomposition products. *Sagrada glucosides*. *Cascarin* is obtained by extracting the bark with boiling water containing a little Na_2CO_3, purifying and finally crystallizing from acetone. It forms yellow needles, crystallizing with 2 mols. H_2O. Soluble in water and in alcohol, insoluble in Et_2O, $CHCl_3$ and C_6H_6. On hydrolysis it forms rhamnose and rhamnetin. *Peristaltin*, a yellowish amorphous powder obtained from cascara bark is a mixture glucosides and hexoses. It yields rhamnose cascarol chrysophanic acid and emodinic acid monomethyl ether. *Cascarol*, $C_{15}H_{10}O_5$, is an isomer of emodin. It forms yellow needles from pyridine, m.p. 218°C.

Aloe Glucosides. The active principles of the various aloes are represented in commerce as the aloins, barbaloin (capaloin or ugandaloin); socaloin, although stated to be identical with barbaloin, is found in commerce under the former name; nataloin and homonataloin. Pure barbaloin crystallizes from alcohol in long, yellow prisms, m.p. 138–139°C.; after drying over H_2SO_4, if free from isobarbaloin, it softens at 145–149°C. Readily soluble in water, acetone, EtOH, acids, dilute alkalies; insoluble in Et_2O, $CHCl_3$ and other solvents. When heated for a long time in EtOH solution with HCl, *aloemodin* is formed (methyl iso-oxychrysasin). Attempts have been made to modify the

nauseous bitter taste of aloin. A substance claimed to be thus improved for medicinal use is *Formaloin*, a light yellow amorphous powder, obtained by the action of formaldehyde on aloin. It is practically insoluble in water, but soluble in alkaline solutions. *Aloin carbonic acid ester*, *aloin ethyl carbonate*, *aloin allophanate* are described as being tasteless and active aloin compounds. Iso-barbaloin, nataloin, homonataloin and socaloin have been previously described by Léger and others.

Absinthin, $C_{16}H_{20}O_4$, is an amorphous glucoside from *Artemisia absinthium*. Sometimes met with in fine, white, silky needles, m.p. 168°C., sparingly soluble in water. Given as a tonic. Best administered in pill form. Dose, $1\frac{1}{2}$ to 4 grains twice daily before meals.

Pseudo-baptisin, $C_{27}H_{30}O_{14} + 7\frac{1}{2}H_2O$ from the root of *Baptisia tinctoria*, or wild indigo, occurs in tasteless white needles, m.p. 247 to 248°C., soluble in hot water, in acetone and in MeOH; $\alpha_D - 101°40^1$. Coloured first yellowish brown, then orange red by H_2SO_4, on adding HNO_3 violet, red and olive green. When hydrolysed with dilute H_2SO_4 it splits up into rhamnose, glucose and pseudo-baptigenin, a crystalline powder not melting at 270°C., insoluble in water, acetone and alcohol. The dose of pseudo-baptisin is $\frac{1}{2}$ to 5 grains, as an aperient, in pill or powder. *Colocynthin* or *Citrullin* has the formula $C_{56}H_{42}O_{23}$ or $C_{98}H_{140}O_{43}$, and is the bitter principle of *Citrullus colocynthis*. It occurs in the fruit to the extent of 0·6 per cent. It is met with as an amorphous resinoid mass, readily soluble in water and in EtOH; but not in Et_2O. Its solutions reduce Fehling's reagent, and on hydrolysis it is split up into glucose colocynthein, acetic acid, and other volatile substances. Colocynthin is a drastic purgative. Dose, $\frac{1}{3}$ to $\frac{1}{2}$ grain.

Euonymin is the glucoside of *Euonymus atro-purpureus*. A yellowish powder readily soluble in EtOH, almost insoluble in water. Generally met with mixed with milk sugar. Used as a cholagogue and aperient in doses of $\frac{1}{2}$ to 3 grains.

Anthermic Glucosides.—*Salicin* and *gentiopicrin* are the two chief of these. The former is too well known to need description. *Gentiopicrin*, $C_{16}H_{20}O_6$, exists to the extent of 1·5 per cent. in the fresh root of *Gentiana lutea*. It occurs in colourless, bitter needles, containing $\frac{1}{2}$ mol. H_2O and melting at 91°C., or when anhydrous at 122°C. Readily soluble in water, sparingly soluble in EtOH, insoluble in Et_2O. The solution in strong H_2SO_4 becomes carmine red on heating. Besides this the root contains *gentiamarin*,

$C_{16}H_{20}O_{10}$ or $C_{16}H_{22}O_{10}$, and *genticin*, $C_{25}H_{28}O_{14}$. Gentiopicrin appears to be quite harmless and is an effective remedy for malaria in doses of 20 to 30 grains. It may be used as a substitute for quinine.

ANALGESIC GLUCOSIDES.—*Solanin*, from potato shoots, and *Solanum dulcamara*, occurs in silky needles, m.p. 250°C. Sparingly soluble in cold alcohol, readily dissolved on warming, almost insoluble in cold water. Given as an analgesic and sedative. Dose, $\frac{1}{6}$ to 1 grain several times a day. The hyhrochloride is given hypodermically. Used as a substitute for bromides in epilepsy.

HYPNOTIC GLUCOSIDES—.Among these the synthetic products, the chloraloses and chloral compounds of laevulose, galactose, xylose and arabinochloral may be included.

THERAPEUTICALLY UNCLASSIFIED GLUCOSIDES.—*Arbutin*, $C_{12}H_{16}O_7 + \frac{1}{2}H_2O$. M.p. 144–146°, when anhydrous 176°C. Soluble 1 : 8 in cold water ; 1 : 16 in alcohol. Arbutin does not act on the liver or kidneys. It has been given in doses 2 to 5 grains, three or four times daily, for vesical catarrh. Arbutin forms an addition product with hexamethalene-tetramine, which separates from ice-cooled MeOH in crystals, having the formula $C_{18}H_{18}O_7N_4+2H_2O$. Very soluble in water, and hygroscopic. Has been prescribed for cystitis.

Globularin, $C_{15}H_{20}O_8$, from the leaves of *Globularia alypum* and *G. vulgaris*, is an amorphous bitter mass, soluble in water and in alcohol, insoluble in Et_2O. It resembles caffeine in its action on the heart-nervous system. It increases the volume, sp. gr. and the uric acid of the urine. It is a powerful diuretic. Has been prescribed for gout, rheumatism and diabetes.

Coriamyrtin, $C_{15}H_{18}O_5$ (?), is the glucoside of *Coriaria myrtifolia*. Colourless bitter prisms ; m.p. 228–229° ; sparingly soluble in cold water or in cold EtOH. It resembles picrotoxin in its action on the muscles. It has been prescribed in conjunction with caffeine.

Glucosides Derived from Oxymethylanthraquinones, Gravimetric Method of Determining. — Daels. (*J. Pharm. Chim.*, 1913, **7**, 591.) The method depends on the fact that the anthraglucosides, which are the chief purgative constituents in rhubarb, senna, cascara sagrada, and similar drugs, are insoluble in $CHCl_3$. When the anthraglucosides are hydrolysed by dilute acid, the oxymethyl anthraquinones formed are soluble in $CHCl_3$ and may

be removed by that solvent. The drug is first treated with $CHCl_3$, which removes the free anthraquinones and other substances soluble therein. The residue is then heated with dilute H_2SO_4 and the liberated oxymethyl anthraquinones are shaken out with $CHCl_3$. The $CHCl_3$ solution is purified, first by treatment with $NaHSO_3$ solution, then with water acidified by HCl. After this treatment the $CHCl_3$ is distilled off and the dry residue weighed. The free oxymethylanthraquinones removed by $CHCl_3$ in the first treatment before hydrolysis may be thus determined. The $CHCl_3$ extract is shaken out with NaOH. The alkaline liquid is rendered acid with HCl and shaken out with $CHCl_3$. On evaporating the solvent the free oxymethylanthraquinones are left, when dry, in a weighable condition.

Glucosides of the Digitalis Group. G. Cohn. (*Pharm. Zentralh.*, 1913, **54,** 496.) DIGITALIS GLUCOSIDES.—The leaves of *Digitalis purpurea* and of *D. grandiflora* yield digitoxin, digitalin verum, and digitonin. Gitalin, gitin and digitophyllin are also recently named definite active constituents. *Digitoxin*, $C_{64}H_{54}O_{11}$, is contained to the extent of 0·25 per cent. in the freshly harvested leaves. It forms a white, odourless, bitter, crystalline powder of fine needles or leaflets; the hydrated form, crystallizing from EtOH 85 per cent., melts at 145–150°C. From equal vols. of MeOH and $CHCl_3$, Et_2O precipitates it anhydrous, sintering at 238–240°C. Practically insoluble in water, hot or cold, hardly soluble in Et_2O, sparingly soluble in EtOH. With strong HCl, sp. gr. 1·19, it gives a green colour. If 0·001 Gm., dissolved in 5 c.c. of glacial $HC_2H_3O_2$, is treated with a few drops of 1 : 20 Fe_2Cl_6 solution and floated on an equal volume of strong H_2SO_4, a dull green colour at first appears. Soon the upper layer of the H_2SO_4 turns brownish red, over which a broad, deep, brown-green band is formed; these colours soon change to deep indigo blue (Keller's reaction). Kiliani's reaction is obtained by using strong H_2SO_4 to each 100 c.c., of which 1 c.c. of a 5 : 100 solution of $FeSO_4$ has been added. One c.c. of this reagent is dissolved in 100 c.c. of glacial $HC_2H_3O_2$ and the glucoside is added to the mixture. The bluish green band is thus obtained sharper. On heating digitoxin with dilute alcoholic NaOH, *sodium digitoxinate* is obtained, which is devoid of physiological action. The corresponding Ca salt is $(C_{34}H_{55}O_{12})_2Ca + 3H_2O$ and the acid $C_{34}H_{56}O_{12}$. By leaving digitoxin in contact with

eight parts of EtOH 50 per cent. and two parts of HCl, sp. gr. 1·19, a temperature not exceeding 25°C., a sugar *digitoxose*, $C_6H_{12}O_6$, and a hydrolysis product, *digitoxigenin*, are obtained. Digitoxose forms tablets, m.p. 101°C., α_D + 46°. Digitoxigenin forms characteristic crystals, softening at 225°C. and melting with discoloration at 23°C. When dissolved in H_2SO_4 containing Fe_2O_3 it gives a red colour and a marked fluorescence. It is converted by alcoholic HCl into *anhydro-digitoxigenin*. $C_{22}H_{30}O_3$, m.p. 215–220°C. With alcoholic NaOH it gives *digeninic acid*, $C_{22}H_{34}O_5$, m.p. 220–230°C. *Digitalin verum* occurs, according to Kiliani, only in the seeds, not in the leaves. It forms a characteristic, colourless mass of granules, or white needles, forming warty tufts from MeOH 85 per cent. It has a bitter taste, sinters at 210°C., melts at 217°C., with a yellow colour. Soluble about 1 : 1,000 in water at normal temperatures, 1 : 100 in alcohol 50 per cent., easily soluble in absolute EtOH, sparingly soluble in $CHCl_3$ and in Et_2O. Soluble in strong HCl and in pure H_2SO_4, with a yellow colour. On adding a particle of solid KBr to the H_2SO_4 solution, a fine red colour is formed. H_2SO_4 containing Fe gives at once a bluish tint, then a more or less intense permanent red colour. With a warm solution of 0·5 of SeO_2 in 100 of H_2SO_4 digitalin gives at first a bluish violet, then a brown colour. When digitalin in eight parts of alcohol 80 per cent. is heated with two parts of HCl, sp. gr. 1·19, in the boiling water-bath, glucose, digitalose and digitaligenin are obtained. *Digitalose*, $C_7H_{14}O_5$, has not been obtained crystalline. On oxidation, it forms *digitalonic acid*, the lactone of which $C_7H_{12}O_5$ forms colourless crystals, m.p. 138–139°C. *Digitaligenin*, $C_{22}H_{30}O_3$, crystallizes from EtOH in white needles, m.p. 210 – 212°C.; insoluble in water, sparingly soluble in Et_2O, readily dissolved by EtOH. It is the substance which gives the colour reaction with H_2SO_4 and Fe. (See also *Y.B.*, **1906,** 97.) *Digitonin cryst.* $C_{54}H_{92}O_{28}$ + $5H_2O$, forms fine white needles grouped in warts; beginning to sinter at 225°, turning yellow and softening at 236°C.; α_D — 50°. Very sparingly soluble in water, slightly soluble in cold EtOH, more so on warming, readily dissolved by amyl alcohol, hardly in $CHCl_3$, insoluble in Et_2O, C_6H_6 and petroleum ether. The aqueous solution froths when shaken. The glucoside is not coloured by cold H_2SO_4 or HCl, nor with H_2SO_4 and Fe. On warming with strong H_2SO_4 it gives a pomegranate red colour passing to blue. When heated with dilute acids it is hydrolysed

into digitogenin, glucose and galactose. *Digitogenin* forms fine needles, having the formula $C_{30}H_{48}O_6C_{30}H_{50}O_6$ or $C_{31}H_{52}O_6$. It softens at 250°C. Sparingly soluble in EtOH; does not combine with phenylhydruzin. On oxidation it yields digitogenic acid. (See also *Y.B.*, **1911,** 120.) *Gitalin*, $C_{28}H_{48}O_{10}$ + $4H_2O$ forms leaflets, m.p. 150°–155°C., soluble 1 : 600 in cold water, readily soluble in water. Converted by dilute alcohol into *gitalin hydrate*, m.p. 75°C., sparingly soluble in EtOH. On evaporating the EtOH solution *anhydrogitalin* is obtained in crystals, m.p. 255°C. Gitalin gives a permanent violet colour with H_2SO_4 and Fe. On hydrolysis, it forms digitoxose and anhydrogilaligenin. *Gitin*, another glucoside from the leaves, forms galactose and digitogenin when hydrolysed. (See also *Y.B.*, **1911,** 119.)

Digitophyllin, $C_{32}H_{52}O_{10}$ (?), forms pearly prismatic or tabular crystals, m.p. 230-232° with decomposition. It affords the same colour reactions as digitoxin with H_2SO_4 and Fe.

Commercial Digitalis Glucosides.—*Digitoxin cryst. Digitoxin*, Merck, is a chemically pure substance practically identical with the digitoxin of the French codex, and official in the Swiss Pharmacopœia. The glucoside is removed from the leaves by means of EtOH 50 to 60 per cent., after water soluble constituents have been extracted. After purification, it is crystallized from EtOH 80 per cent. For administration, it is conveniently dispensed in tablets each containing 0·0002 Gm. These may be dissolved in a mixture of 100 c.c. of tepid water and 15 drops of absolute EtOH. (See also *Y.B.*, **1906,** 97; **1908,** 67; **1911,** 118, 120.)

Digalen. Digitoxin solubile, Cloetta, is an amorphous white variety of digitonin with a lower molecular weight, more easily dissolved and diffused in water. Prepared for use in solution in water 3 and glycerin 1. Each c.c. is equivalent to 0·0003 Gm. of amorphous digitoxin or 0·15 Gm. of leaves. (See also *Y.B.*, **1905,** 184; **1906,** 97.)

Digitalin germanicum pur. pulv. Amorphous digitalin is a mixture of digitonin, true digitalin and digitalein. It is yellowish white powder, soluble in water and in EtOH, insoluble in $CHCl_3$ and in Et_2O. It must be kept protected from light and air.

Digitalin verum. Schmiedeberg's and Kiliani's digitalin, like French digitalin, is the so-called pure glucoside. It is obtained by precipitating a solution of the above German digitalin in

alcohol 95 per cent., by means of Et_2O, rejecting the precipitate, evaporating the filtrate *in vacuo* and purifying the residue by recrystallization. It is prepared by Boehringer. *Digitalin pur. Amorph.; Ph. Gall., Ph. Belg.; Digitaline chloroformique, Digitalin gallicum, Homolles Amorphous digitalin.* Consists of the amorphous glucosides with a physiological action allied to digitoxin. Prepared by purifying the aqueous extract of the leaves. It forms a yellowish white, aromatic, bitter powder; soluble in EtOH and in $CHCl_3$, almost insoluble in water, insoluble in Et_2O. Administered in the form of pills or granules. It has declined in importance.

Digitaline crystallisée. Formerly a mixture of several substances. Now pure digitoxin.

Digitalein, Schmiedeberg. A mixture of water-soluble active glucosides, of amorphous and crystalline digitonin, and gitalin. It is obtained from commercial German digitalin, from seeds, of which it forms the water-soluble part. A yellowish-white, amorphous, bitter powder; readily soluble in absolute EtOH, insoluble in Et_2O and in $CHCl_3$. The aqueous solution froths when shaken, and is precipitated with basic lead acetate, AmOH, and tannin. (See also *Y.B.*, **1911,** 119.)

The details for the preparation of most of the above are given in the original article; also sections devoted to the pharmacology, therapeutics and toxicology of the digitalis glucosides. (See also *Y.B.*, **1908,** 66; **1911,** 118; **1912,** 193.)

Glucosides Pharmacologically Allied to the Digitalin Group. *Adonidin.* Isolated by Cervello from the herb and roots of *Adonis vernalis, A. cupaniana* and *A. aestivalis.* It is a yellowish-white, amorphous, odourless, very bitter powder; very soluble in water and in EtOH, sparingly soluble in Et_2O and $CHCl_3$. It is stated by Frickelmann to consist of two substances, adonidinic acid and neutral adonidin, having similar therapeutic action. Adonidin, Merck, is given in various heart affections in doses of 0·001 Gm. to 0·03 Gm. The maximum dose is 0·1 Gm. It has no cumulative action. Adonidin produces local anæsthesia, but is inferior to cocaine in this respect.

Antiarin, $C_{27}H_{12}O_{10} + {}_4H_2O$, is obtained from the latex of *Antiaris toxicaria.* It crystallizes diamond-shaped leaflets, m.p. 220–225°C.; soluble in water and EtOH, sparingly soluble in Et_2O. Dissolves in H_2SO_4 and Fe with a yellow colour, changing to reddish. Hydrolysed with dilute HCl, it forms *antiarose* and *antiarigenin.* The former is an isomer of rhamnose. The

latter forms glittering needles, m.p. 170°. Besides the above α-antiarin, the latex contains another glucoside *β-antiarin*, forming needles or pillars, m.p. 206–207, having the formula $C_{22}H_{30}O_8$. (?). (See also *Y.B.*, **1911,** 196.)

Cerberid, $C_{25}H_{38}O_{12}$, obtained from the seeds of *Thevetia Yccotli*, is an amorphous, yellowish, soluble powder. On hydrolysis, it forms glucose and cerberiresin.

Convallamarin, $C_{23}H_{44}O_{12}$, is obtained from *Convallaria majalis* flowers as a white crystalline bitter powder, easily soluble in water, insoluble in $CHCl_3$ and amyl alcohol. On hydrolysis, glucose and convallamaretin, $C_{20}H_{36}O_8$, are obtained. The dose of convallamarin for an adult is from 0·05 Gm. to 0·2 Gm. for a single dose, or 0·03 Gm. twice daily. (See also *Y.B.*, **1905,** 183.)

Coronillin, $C_7H_{12}O_5$ obtained from a number of members of the genus *Coronilla*. It is a yellowish light powder, readily soluble in water, EtOH, acetone and amyl alcohol. In its action it closely resembles digitoxin.

Helleborein, $C_{37}H_{55}O_{18}$ is the glucoside of *Helleborus niger* and *H. viridis*. The root is first treated with Et_2O to remove helleborin, and then extracted with water. Helleborein is isolated from this aqueous extract and purified. It crystallizes from absolute EtOH in almost colourless transparent aggregations of needles. The powder is a powerful sternutory. Very soluble in water, less so in EtOH, insoluble in Et_2O. By prolonged boiling with HCl 1 : 2 it is hydrolysed with formation of acetic acid, glucose and *helleboretin* $C_{19}H_{30}O_5$. In its pharmacological action helleborein closely resembles digitoxin. It is given internally in doses of 0·01 to 0·02 Gm. in 24 hours. It is cumulative in its action.

Oleander Glucosides. Neriin, from the bark and leaves of *Nerium oleander*, is a lemon yellow, amorphous, very bitter substance ; readily soluble in water and in absolute alcohol, insoluble in Et_2O. It gives a purple red colour with H_2SO_4 and Br fumes. *Nerianthin*, an amorphous or crystalline substance resembling digitalin in its action. *Oleandrin*, a colourless, amorphous substance soluble in EtOH and in $CHCl_3$, very little soluble in water. Extremely toxic. *Rosaginin*, obtained from the fat free bark in almost colourless crystalline warts ; m.p. 171 ; almost insoluble in water, Et_2O or $CHCl_3$, soluble, in EtOH. It is a local anæsthetic and is extremely poisonous. *Neriodorerein*, an amorphous, yellow bitter powder, readily soluble in water,

insoluble in most organic solvents ; on hydrolysis besides glucose, a yellow amorphous substance and a crystalline body are obtained. (See also *Y.B.*, **1912,** 129.)

Ouabain is obtained from the wood *Acocanthera ouabaio.* It is a yellowish-white, amorphous, bitter powder, very like digitalin in its action. Readily soluble in water and in EtOH. Decomposes at 180°. Dissolves in strong H_2SO_4 with a green fluorescence. *Periplocin* is the active principle of *Periploca graeca*, isolated from the bark. In fine, long needles, m.p. 205°C. ; soluble in water, readily dissolved by alcohol, only slightly by other solvents. On hydrolysis it forms a sugar and *periplogenin*, $C_{24}H_{34}O_5$, crystallizing in long prisms, m.p. 185°C., insoluble in water, soluble in EtOH, Et_2O and $CHCl_3$. It gives an intense blue colour with H_2SO_4. (See also *Y.B.*, **1911,** 218.)

Strophanthins. There are three kinds of strophanthin met with in commerce. *G.- or Gratus-strophanthin*, $C_{36}H_{46}O_{12} + 9H_2O$, is identical with crystalline ouabain. Obtained from the seeds of *Strophanthus gratus*, *G. glaber* and the wood of *Acocanthera ouabaio* in the form of slightly bitter, quadratic tablets. After drying at 100°C. these sinter at 185°C., soften at 200°C. and decompose at 205°C. Soluble 1 : 100 of cold water, 1 : 30 of EtOH, sparingly soluble in Et_2O and $CHCl_3$. In H_2SO_4 it gives a red colour. On hydrolysis, rhamnose and a resin, $C_{24}H_{28}O_4$, are formed. The maximum dose is 0·005 Gm.

K.- or Kombé strophanthin. Amorphus strophanthin, $C_{32}H_{48}O_{16}$, isolated from the oil-free seeds of *Strophanthus Kombé.* It is very bitter, readily soluble in water and in EtOH, sinters after drying at 170°C., α_D + 11·87°. With strong H_2SO_4 an emerald green is formed. In acetic anhydride it dissolves, and on adding a little H_2SO_4 gives a red colour, changing on gentle warming to bright green. When hydrolysed with 1 : 200 HCl it forms *strophanthobiose methyl ether* and strophanthidin. The former is a white crystalline powder, m.p. 207°C., very soluble in water, soluble in warm EtOH and acetone, but not in MeOH. It is dextrorotatory, does not combine with phenylhydrazin, and does not ferment with yeast. It gives mannose and rhamnose as decomposition products. *Strophanthidin*, $C_{27}H_{38}O_7 + 2H_2O$, crystallizes from water in monoclinic prisms, m.p. 178–180°C. Another statement gives a double melting point, first at 169–170°C., and then after solidifying melting again at 232°C. Maximum internal dose, 0·0005 Gm. or 0·003 Gm. in 24 hours ; or hypodermically, 0·001 Gm.

H-Strophanthin, $C_{40}H_{60}O_{16}$. Obtained from the seeds of *Strophanthus hispidus* as a neutral, white, bitter, very hygroscopic microcrystalline powder; readily soluble in water and in EtOH; insoluble in Et_2O, C_6H_6 and CS_2. With a mixture of H_2SO_4 8 vols. and water 2 vols. it gives a green colour; α_D + 13·9°, sinters at 160°C., and is not melted at 190°C. On hydrolysis it gives *saccharobiose*, $C_{12}H_{22}O_{11}$, and strophanthidin, $C_{27}H_{37}O_6$. CH_3. This strophanthidin crystallizes from alcohol in white needles. Besides these Heffter and Sachs have isolated a crystalline strophanthin from Kombé seeds. This is sparingly soluble in water and in $CHCl_3$, readily soluble in EtOH, almost insoluble in Et_{20}; gives a green colour with H_2SO_4; softens between 177 and 181°C. α_D + 28·72°. (See also *Y.B.*, **1904,** 244; **1905,** 202, 370; **1906,** 74, 110; **1907,** 151; **1910,** 220; **1911,** 125; **1912,** 280, 281.)

Grevillea Robusta Leaves, Presence of Quebrachitol in. E. Bourquelot and A. Fichtenholz. (*J. Pharm. Chim.*, 1913, **6,** 346.) The large anhydrous rhombic prisms, obtained by extracting the fresh leaves of *Grevillea robusta* with alcohol 95 per cent. have been identified as quebrachitol, $C_7H_{14}O_6$; m.p. 190°C. The leaves gave 0·4 per cent., and the bark 0·1 per cent.

Hederin, Properties of, Pharmacological. B. Moore. (*J. Pharmacol.*, **4,** 263.) Hederin, the glucoside of the common ivy, is a hemolytic characterized by the "hemolytic paradox," i.e., hemolysis is quicker and more complete with smaller than higher concentrations. It acts as an irritant to the alimentary canal, causes vasoconstriction, lowers the blood pressure, slows the heart, increases its tonus and causes death by a paralysis of the respiration.

Hepatica Triloba, Glucoside in. — Delattre. (*J. Pharm. Chim.*, 1912, **6,** 292.) The biological method of Bourquelot has enabled the author to isolate a new crystalline glucoside, *hepatrilobin*, from the leaves of the liverwort, *Hepatica triloba*. Besides this the plant contains saccharose, and ferments which hydrolyse both the sugar and the glucoside.

Honey, Detection of Glucose in, by Means of β-Naphthol. F. M. Litterscheid. (*Chem. Zeit.*, 1913, **37,** 243.) From 10 to 20 Gm. of the honey is rubbed with about 10 c.c. of Et_2O,

four times in succession. The Et_2O extract is filtered into a flat-bottom porcelain dish, and a few crystals of β-naphthol are added and dissolved. The Et_2O is then allowed to evaporate spontaneously in a dark cupboard. When all has gone, from 4 to 5 c.c. of 88 to 90 per cent. H_2SO_4 is allowed to flow over the whole surface of the residue, and the dish is set aside for half an hour. Pure honey will then give a dull, yellowish-green colour. Sometimes it at first gives a faint pinkish tint, but this does not persist. In presence of glucose a more or less intense claret to bluish violet colour will be evident, proportional to the amount of glucose present. It is important that the H_2SO_4 should be of the strength specified.

Honey, Inversion of Cane Sugar by. — Ackert. (*Pharm. Zentralh.*, 1913, **54,** 152.) In honey derived from hives in which the bees have been sugar fed, with cane sugar syrup and bee candy, as is the universal practice with modern bee keepers, it is found that 50 per cent. of the sucrose is inverted in 5 weeks. A mechanical mixture of cane sugar and honey, the inversion of the former was found to proceed rapidly at normal temperatures. If the honey be heated, the inverting ferment is destroyed. It is not due to the acids present in honey, since it proceeds when the honey is neutralized with an alkali. [It may be noted that the sugar feed of bees is not simply mixed with honey in the hives. It is absorbed first by the workers into their crops, and doubtless receives a trace of an active enzyme.—Ed., *Y.B.*]

Honey, Natural, Detection of Artificial Honey in. G. Armani and I. Barboni. (*Chem. Zeit.*, 1912, **35,** 383; *Chem. Abstr. Amer. Chem. Soc.*, 1912, **6,** 3133.) If an aqueous solution of artificial honey is treated with an acetic acid solution of benzidine, a deep yellow colour is produced immediately, attaining maximum intensity in 15 minutes, and remaining unchanged for several days. Natural honey, warmed or not, or centrifuged, does not give this reaction; an addition of 20 per cent. of artificial honey can be detected. Nitrites give a similar reaction with the reagent, but the reaction with artificial honey is not produced by nitrites. Two Gm. of honey are dissolved in 10 c.c. of water in a porcelain dish and 1 c.c. of a saturated solution of benzidine in dilute acetic acid is added, and the determination made colorimetrically.

Honey, Russian, Tests for. E. J. Sarin. (*Zeits. Unter-*

such. Nahr. Genusmitt. 1913, **28,** 131.) After the examination of a large number of samples of Russian honey the author arrives at the following conclusions. The amount of water does not exceed 22 per cent. Ripe honey does not contain more than 5 per cent. of saccharose. No very great practical value can be attached to the determination of invert sugar, ash, acids and N, for the purpose of determining the purity or otherwise of the sample. Except in the case of coniferous honey, dark colour indicates a high Fe, Mn, albumin and catalase content. Lund's albumin precipitation test has no great value, nor has the determination of the catalase. Fiehe's test is of considerable practical value for the detection of adulteration of honey with invert sugar. The test is not affected by heating the honey to 100°C. Nothing less than a cherry red colour should be taken as definite. The tests of Browne, Jägerschmidt, Armani and Barboni are less delicate. Fiehe's reaction is certain and sensitive for added glucose. (See also *Y.B.*, **1908,** 93; **1910,** 111; **1911,** 121, 122; **1912,** 127, 128.)

Ipuranol and some Allied Compound, Identification of, as Phytosterol Glucosides. F. B. Power and A. H. Salway. (*Trans. Chem. Soc.*, 1913, **103,** 399.) It has previously been recorded in connection with the description of ipuranol and some allied compounds to which distinctive names and formulae had been assigned, such as citrullol, trifolianol, ipurganol, bryonol, cluytianol, etc., that they yield colour reactions very similar to those given by the phytosterols. The observation has now been made that several of these compounds, when heated in the presence of a little alcohol with aqueous hydrogen chloride, undergo hydrolysis, with the formation of a phytosterol and dextrose. The formula originally assigned to ipuranol, namely, $C_{23}H_{40}O_4$, requires C = 72·6; H = 10·5, whereas a sitosterol glucoside, $C_{33}H_{56}O_6$, requires C = 72·3; H = 10·2 per cent., and the latter figures are likewise in excellent agreement with the analytical results recorded for ipuranol and some allied compounds. The hydrolysis of ipuranol may therefore be represented by the following equation: $C_{33}H_{56}O_6 + H_2O = C_{27}H_{46}O + C_6H_{12}O_6$.

Direct evidence of hydrolysis was experimentally obtained with citrullol, bryonol and cluytianol.

It is concluded that all the compounds of the type of ipuranol are glucosidic in character, although the phytosterols obtained

by their hydrolysis are not in all cases identical. In place of the distinctive names which have previously been assigned to a number of these substances, it is proposed to designate them collectively as *phytosterolins*.

The following is a list of these substances together with their botanical source :—

Ipuranol, $C_{23}H_{10}O_4$ from *Ipomoea purpurea*; olive bark, nutmeg, *Prunus serotina*, bark and leaves; *Apocynum androsaemifolium*, *Rumex Ecklonianus*, *Ornithogalum thyrsioides*, *Gelsemium sempervirens*, *Iris versicolor*, *Withania somnifera*, *Buphane disticha*, *Oenanthe crocata*, *Casimiroa edulis*, *Ipomoea orizabensis*, scammony root: citrullol, $C_{22}H_{38}O_4$ from colocynth, *Euonymus atropurpureus*, *Caulophyllum thalictroides*: trifolianol, $C_{21}H_{36}O_4$, from *Trifolium pratense* and *T. incarnatum*: calabarol, $C_{23}H_{36}O_4$, from calabar bean: ipurganol, $C_{21}H_{34}O_4$, from *Ipomoea purga*: Bryonol, $C_{22}H_{36}O_4$, from bryony root: grindelol, $C_{23}H_{38}O_4$, from *Grindelia camporum*: anonol, $C_{23}H_{38}O_4$, from *Anona muricata*: cucurbitol, $C_{24}H_{40}O_4$, from watermelon seed: cluytianol, $C_{29}H_{50}O_5$, from *Cluytia similis* and taraxacum root.

Small amounts of similar substances were also obtained from the fruit of *Ecballium elaterium* and the bark of *Erythrophloeum guineense*.

Menyanthes Trifoliata, Variation in the Constituents of, During the Year's Growth. M. Bridel. (*J. Pharm. Chim.*, 1913, **7**, 529.) Systematic examination of the fresh herb of *Menyanthes trifoliata* during the whole period of its growth, from May to October, shows that, like gentian, it varies considerably in the amount of its active constituents during that period, although the modifications are less marked than in the case of the latter plant. In May, at the earliest period, the amount of carbohydrates hydrolysed by invertin was 0·95 per cent.; in October these amounted to 2·761 per cent. During the whole period, the plant contains less than 1 per cent. of meliatin: this glucoside is present in maximum quantity in May, when it amounts to about 0·90 per cent. falling to 0·655 per cent. in October; it is, in fact, present in inverse ratio to the carbohydrates. The latter are the reserve material, and show much greater differences in the amount present than the glucoside, which is much more constant. The carbohydrates are gradually stored up. As in the case of gentian the glucoside

does not appear to play a very important part in the nutriment of the plant. (See also *Y.B.*, **1911,** 120 ; **1912,** 128.)

Milk Sugar, Method of Preparing on Commercial Scale. J. Pedersen. (*J. New Zealand Depart. Agricult.; Chem. and Drugg.*, 1913, **82,** 342.) *German System.*—The whey is treated as soon as possible with milk of lime, from 50 to 100 Gm. of lime being added to each 20 gals. of whey, according to acidity. The neutralized whey is evaporated *in vacuo* to a sp. gr. of 1·264 to 1·286. Condensation beyond this results in the whey syrup becoming very smeary or greasy, and in a lessened yield of milk-sugar. The thick syrup is run into shallow vats, and occasionally stirred during the first ten hours. In about two and a quarter hours' time the temperature should be about 68°F. It now appears like a yellow-grained pulp or a supernatant oily layer. To separate the crystals the sticky mass is mixed with cold water and centrifuged. The lactose crystals are washed on the washer-screen. Two-thirds of the milk-sugar is extracted in this way, the remainder being left in the syrup. The latter is heated to boiling-point, the coagulated albumin skimmed off, and again concentrated *in vacuo* to sp. gr. 1·321. After cooling, the lactose is separated from the greasy brown mass and well washed, from 0·3 to 0·7 per cent. being recovered. In practice about 4 per cent. of raw milk-sugar is obtained from the whey. To remove albumin, traces of fat, etc., the raw product is decolourized and recrystallized. The crude lactose is dissolved in water at 112°F. to make a syrup containing 24 to 27 per cent. of milk-sugar (sp. gr. 1·116). The solution is then heated to boiling-point after the addition of 1 per cent. of powdered charcoal and 0·2 per cent. of acetic acid. While nearly boiling some makers add some $MgSO_4$ and keep the solution boiling for a few minutes, but this causes considerable foaming. While still hot the liquid is passed through a filter-press, and the clear syrup concentrated *in vacuo* to sp. gr. 1·321, crystallized, and the milk-sugar separated, washed and dried. The last operation is conducted in rotary inclined cylinders through which a current of hot air passes, or in vacuum dryers, on the shelves of which the moist lactose is placed in thin layers. After cooling the dried sugar is finely ground in a pebble-mill, and packed in cases containing 100 lb. to 200 lb. The percentage of refined sugar obtained from whey is 2·5 to 2·6 per cent.

The Swedish System consists in scalding fresh whey as soon as possible, skimming off albumin and fat, and condensing to one-third of the original volume in an open cheese-pan. It is further concentrated *in vacuo* at 143°F. to a suitable consistence, and the product run into large enamelled pans with slow rotary stirrers. It cools within 48 hours to 78°F. Crystallizing and refining follows the German method outlined above, with the exception that some alum is added to the decolourized solution of milk-sugar before filtration.

The total cost of production of 1 ton of milk-sugar in Sweden is given at £20 per ton from whey valued at ½*d.* per gal.

Morphine-Glucoside. C. Mannich. (*Liebig's Annalen*, **394,** 223; *Apoth. Zeit.*, 1913, **28,** 111.) By the interaction of morphine in Na_2CO_3 solution and acetobromoglucose dissolved in acetone morphine-glucoside, $C_{17}H_{18}NO_3 \cdot C_6H_{11}O_5 \cdot H_2O$. has been obtained in bitter, well-formed needles. Physiologically, it has only the action of the morphine it contains. In this respect it differs from most glucosides, which have a more marked pharmacodynamic action than the constituents into which they are resolved by hydrolysis.

Oxydases and Oxydones, Distinctions Between. F. Battelli and L. Stern. (*J. Pharm. Chim.*, 1913, **7,** 374.) Oxydases are soluble, oxydones insoluble, in water. Oxydases may be prepared by treating the tissues containing them with EtOH or with acetone and by drying the residues *in vacuo*. Acetone and EtOH completely and rapidly destroy oxydones, even when used very weak. Oxydases are not materially weakened by exposure to 60°C. Oxydones are rendered much less active when heated to 55°C. and are almost entirely destroyed at 60°C.

Pancreas Diastase. W. Loeb. (*Biochem. Zeit.*, **46,** 125; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 491.) A very active diastase may be prepared from pig pancreas. The latter is mixed with water and allowed to undergo autodigestion for eight days. The solution is filtered, and the diastase precipitated by addition of an equal volume of EtOH. The yield is 2 Gm. from 50 Gm. of powdered pancreas. The activity of the diastase is increased several times by addition of Michaelis' phosphate mixture to its solutions.

Pancreatin, Valuation of, by Various Official Processes. R.

Delaunay and O. Bailly. (*Bull Sci. Pharm.*, 1912, **19**, 540.) After a critical review of the various methods for the assay of pancreatin, the authors draw the following conclusions. The official processes in different pharmacopœias for the valuation of pancreatin give varying results; a uniform method and standard is desirable. The dry pig's fibrin used in the method of the French Codex is the best substance on which to determine the digestive strength. The HNO_3 test of that pharmacopœia is not, however, to be strictly relied on; it is neither sharp nor accurate. Sorensen's method of precipitating the amino nitrogen with formalin is to be preferred to those already published. An alkaline medium of definite strength should be employed. This should be equivalent to a N/50 Na_2CO_3 solution. The addition of alkali phosphates has no evident use. In presence of Na_2HPO_4 the apparent proteolytic action is greater than with other phosphates.

Papain, Determination of the [Comparative] Digestive Value of. J. R. Rippetoe. (*J. Ind. Eng. Chem.*, 1912, **4**, 517.) Prepare egg albumin as directed under pepsin assay U.S.P. Introduce into a 4 oz. wide-mouth bottle 40 c.c. of NaOH solution, 1 : 1,000, and add 10 Gm. of the disintegrated albumin; stopper the bottle and shake vigorously until the albumin is broken up. Then add 0·1 or 0·2 Gm. of the papain in fine powder and mix by shaking gently for 15 seconds. Place the bottle in a water-bath previously heated to 52°C. and digest at this temperature for 6 hours, removing the bottle every 10 minutes and shaking gently for 15 seconds. At the end of this period transfer the mixture to a 100 c.c. graduated cylinder, rinse the bottle with water, add the rinsings to the mixture and make the volume up to 70 c.c. with water. Set the cylinder aside and after standing for 1 hour read off the volume of the deposit. The deposit may be read a second time after standing 16–18 hours (over night), which seems to give more positive results, especially if the volume is large.

The method is also applicable to determining the digestive value of pineapple juice. One Gm. of dry juice neutralized with NaOH, with 10 Gm. of albumin in 35 c.c. of 1 : 1,000 NaOH and 3 hours' digestion, left a residue of 2 c.c. after 18 hours, while a blank gave 41 c.c.

Papain, Considerations of Methods of Testing. R. Delaunay and O. Bailly. (*Bull Sci. Pharm.*, 1913, **20**, 141.)

Papain, under the conditions of laboratory tests, is mainly a peptonizing ferment, and has very slight peptolytic action. It dissolves and hydrolyses all coagulated proteins such as fibrin; the hydrolysis products are not precipitated by HNO_3 and the amount of N titratable by formaldehyde solution is only small. In this respect, papain resembles pepsin, but differs from it in the fact that its optimal temperature is high, 80°C. in a neutral or feebly alkaline medium. In determining the value of papain, the amount of dry fibrin dissolved, at about 80°C., in a given time, under the above conditions, should be taken as the criterion, rather than the disappearance of matter precipitated by HNO_3 or the proportion of amine N liberated. It might be well to determine the milk coagulating activity, or other enzymatic action. Experiments are given, from which these conclusions are drawn.

Pelargonium Odoratissimum, Geranyl Glucoside in. E. Bourquelot and M. Bridel. (*J. Pharm. Chim.*, 1913, **7,** 319.) The successful synthesis of β-geranyl glucoside, β-cinnamyl glucoside and β-phenyl-ethyl glucoside, by the biological method, has suggested that probably analogous alcohol glucosides occur in nature. This is proved to be so. The fresh plant of *Pelargonium odoratissimum* contains a geranyl glucoside.

Phenylhydrazine Reagent for Sugars, Permanent. G. Denigès. (*Repertoire*, 1913, **25,** 108.) Phenylhydrazine acetate solution, as generally used, is very easily oxidized. The crystalline osazones it forms with sugars also soon become contaminated with oxidation products if left in the mother liquors. The following method of preparing the reagent, using a little $NaHSO_3$, obviates this inconvenience. A solution is prepared with sodium acetate, 10 Gm.; glacial acetic acid, 5 c.c.; and water, 100 c.c. To 20 c.c. of this solution, another 5 c.c. of glacial acetic acid and 1 c.c. of phenylhydrazine, previously liquefied if necessary. After shaking, the liquid is filtered, and to the filtrate 1 c.c. of $NaHSO_3$ solution, sp. gr. 1·277 to 1·300, is added. This reagent will keep perfectly for several months.

Polyscias Nodosa and Hedera Helix, Saponins from. A. W. van der Haar. (*Archiv. Pharm.*, 1912, **250,** 424.) The substance derived from the hydrolysis of *Polyscias* saponin

glucoside is a sapogenin $C_{26}H_{44}O_4$, m.p. 324°C., α_D + 75·58, in pyridine. It gives a violet colour reaction with H_2SO_4, and sublimes at 303°C. A lactone group is present. When hydrolysed, α-hederin from *Hedera helix* forms α-hederagenin, $C_{31}H_{50}O_4$, m.p. 325°C., α_D + 81·2 in pyridine. Similar to the above it contains a lactone group, and yields a terpene-like liquid, $C_{15}H_{24}$, when distilled with Zn dust.

Primula Officinalis, Further Notes on the Glucosides and Essential Oil of. A. Goris, M. Mascré and C. Vischniac. (*Bull. Sci. Pharm.*, 1912, **19,** 577, 648.) The sterilized powdered root was extracted with acetone in presence of $CaCO_3$. After distilling off the solvent, the residue was re-dissolved in water and shaken out with Et_2O until the latter was no longer coloured. The liquid was then evaporated *in vacuo* and the residue dissolved in dry acetic ether, containing 5 per cent. of EtOH 95 per cent. The two glucosides, primverin and primulaverin (*Y.B.*, **1910,** 114), were then separated by fractional crystallization from the same solvents. The fresh roof of *Primula officinalis* gave 0·1 per cent. of total glucosides and those of *P. kewensis* 0·2 per cent. Primverin has the formula $C_6H_3(OCH_3)(COOCH_3)O{\cdot}C_{11}H_{19}O_9$; m.p. 206° (corr.) α_D + 71°53′; sparingly soluble in cold water, soluble in EtOH and in acetone; slightly dissolved by anhydrous acetic ether, but readily soluble in the same containing water. It is hydrolysed by dilute acids and by the enzyme, primverase, with the formation of 1 mol. of the methyl ester of β-methoxyresorcylic acid and in the first case 2 mols. of monoses and in the second, 1 mol. of a biose, primverose, $C_{11}H_{20}O_{10}$. The latter melts at 209°-210°C. on the Maquenne block and exhibits mutarotation, the α_D changing in 24 hours from + 23°01′ to —2°03′ or from + 23°11′ to — 3°17′; it reduces Fehling's solution and yields an osazone melting at 204°–207°C. Primulaverin, isomeric with primverin, could not be isolated in a pure state, but an isomorphous mixture of the two glucosides melted at 163°C. (corr.), α_D = –66°65′; and yielded on hydrolysis with dilute H_2SO_4 the same two monoses with the methyl esters of β-methoxyresorcylic and *m*-methoxysalicylic acids. The essential oil of the root of *P. officinalis* consists exclusively of the two esters just mentioned, the ester of β-methoxyresorcylic acid (the so-called primula-camphor) predominating: the oil from the flowers contains also 10–15 per cent. of an unsaponifiable substance. The enzyme,

primverase, is identical with, or very closely allied to, the betulase of *Gaultheria procumbens*, *Betula lenta*, and *Monotropa hypopytis*. Both enzymes act on the same group of glucosides, namely, those which yield esters of salicylic acid or of hydroxysalicylic acids. Primverase is present in most species of *Primulaceae*; it acts upon the glucosides, which are more or less closely allied to those of *P. officinalis*, with the formation of different essential oils. There is a close resemblance between the *Ericaceae* and *Primulaceae* in regard to the nature of their enzymes and the chemical constitution of their glucosides.

Reversibility of the Actions of Ferments. E. Bourquelot and E. Verdon. (*Comptes rend.*, 1913, **156,** 957.) In the course of the experiments on the synthesis of β-ethylglucose by means of emulsin, it has been observed that a reserve action occurs and that the glucoside formed is hydrolysed into glucose and ethyl alcohol. If emulsin is allowed to act, separately, in an alcoholic medium of identical strength, on dextrose on one hand, and on β-ethylglucoside on the other, the free glucose in the one experiment, and the combined glucose in the other being equal in quantity, it will be found that the two reactions synthetizing and hydrolysing will be arrested when the composition of the two liquids is identical. That is to say when they contain the same proportions of glucose and of β-ethylglucoside. If the amount of emulsin employed is varied, this does not affect the ultimate composition of the liquid when the reaction stops. The same state of equilibrium is attained which is only dependent on the amount of glucose and alcohol present. The same is found to occur with methylalcohol dextrose and emulsin; so it may be taken that conditions controlling the reversibility of the reaction are generally identical. It is observed, however, the duration of the reaction is directly proportional to the amount of ferment present, being most rapidly completed when a larger quantity of emulsin is used.

Rhubarb, Japanese. (*P. J. Jap.; Pharm. Zeit.*, 1913, **58,** 266.) The botanical source of Japanese rhubarb is not certain; possibly it is either *Rheum rhaponticum* or *R. undulatum*. It contains 4·1 per cent. of oxymethylanthraquinones when treated by the method of Tschirch and Edner. (*Y.B.*, **1907,** 139); chrysophanic acid, not quite free from methoxyl, and emodin, m.p., 250-252°C., were isolated in a crystalline condition. (*Y.B.*,

1914, 146, 156; **1906,** 107; **1907,** 136, 138; **1908,** 168, 169, 251; **1911,** 205; **1912,** 204, 261.)

Rhubarb, New, from Altai. A. Tschirch and M. Ruszkowski. (*Archiv. Pharm.*, 1913, **251**, 121.) This new form of rhubarb from Altai, Western Siberia, contains rhaponticin; chrysophanol; emodin methylether; emodin, m.p. 250°C.; tannoglucosides; anthraglucosides; dextrose. From amount of anthraquinones present the rhubarb is of distinct value. These were determined as follows. Half a Gm. of the finely powdered material was boiled for a time with 5 per cent. H_2SO_4. The powder and solution, without filtering, was then transferred to a separator and shaken out several times with Et_2O. The Et_2O extract was then shaken out with 5 per cent. KOH until the Et_2O solution was colourless. The alkaline liquid was then made up to 500 c.c. A standard solution of emodin 0·001 Gm. in 1,000 c.c. of very dilute KOH was prepared. One hundred c.c of the rhubarb liquor was diluted to 1 litre and a known volume of this further diluted until the colour matched that of the standard. In this manner the presence of 3·2 per cent. of anthraquinones in the rhubarb was indicated, indicating a rhubarb of good quality. (See also *Y.B.*, **1904,** 156; **1905,** 145; **1906,** 107; **1907,** 135; **1908,** 168, 169; **1909,** 206; **1911,** 205.)

Salep, Presence of Erythrodextrin in. E. Recb. (*J. Pharm. Alsace-Lorraine* 1912, 190; *Répertoire Pharm.*, 1913, **25,** 120.) Salep contains a casein-coagulating ferment which is not destroyed by being heated to 100°C. It is stated to be identical with erythrodextrin.

Saponin, Detection of, in Beverages. L. Rosenthaler. (*Pharm. Zeit.*, 1913, **58,** 209; *Zeits. Untersuch. Nahr. Genussm.*, 1913, **25,** 3.) In this method the saponin is converted into sapogenin and the tests applied to the latter product. To the liquid to be tested sufficient HCl is added to make the amount 2·5 per cent. After filtering, if necessary, the liquid is heated on the steam bath until hydrolysis is complete, as indicated by the non-production of froth on shaking. The warm liquid is then shaken out with at least half its volume of acetic ether. The acetic ether solution is decolourized with animal charcoal, and evaporated to dryness and the residue tested as follows. (1) On adding strong H_2SO_4 an orange red colour is given, changing

to cherry red, and finally to violet. (2) On dissolving a little of the residue in Na_2CO_3 solution and diluting, the solution will froth when shaken.

Saponins, Determination of. Marie Korsakoff. (*Comptes rend.*, 1912, **155,** 844.) The method of Christophson, precipitation of saponin as the barium compound, generally adopted for the determination of saponins, is inaccurate, since other substances besides saponins are thus combined. The authoress finds the following modification of the process of Kruskal, separation of the saponins as magnesium compounds, from which the glucosides are removable with boiling EtOH, to give satisfactory results. The dry, finely powdered material is extracted by boiling with several successive portions of EtOH 60 per cent. After hot filtration, the solvent is distilled off, and the residue is evaporated on the water-bath with MgO. The dry powdered residue is extracted with boiling EtOH 80 per cent., filtered, and the filtrate precipitated with Et_2O. The precipitate is collected, dissolved in H_2SO_4, 3 : 100, and hydrolysed in the autoclave at 105°C. The sapogenin thus formed is collected, washed free from acid with water, dissolved in absolute EtOH, evaporated to dryness, and weighed. From the weight of sapogenin thus obtained, the equivalent of saponin is calculated.

Sitosterol, Cholesterol and some Fatty Alcohols, Synthetic Preparation of some d-Glucosides of. H. Salway. (*Proc. Chem. Soc.*, 1913, **29,** 170.) It has already been shown that ipuranol and some allied compounds occurring in plants, to which specific names had been assigned, are phytosterol glucosides (p. 137). In many cases these compounds appear to consist of sitosterol-*d*-glucoside, $C_{27}H_{45}O{\cdot}C_6H_{11}O_5$, whilst in other instances they seem to be a mixture of the latter with the glucoside of stigmasterol, $C_{30}H_{49}O{\cdot}C_6H_{11}O_5$.

The author describes synthetic preparation and properties of some glucosides of the above-mentioned type, and also of the glucosides of some fatty alcohols. The compounds which have now been prepared and characterized are as follows: (1) *Sitosterol*-d-*glucoside*, $C_{27}H_{45}O{\cdot}C_6H_{11}O_5$ (m.p. 295–300°); (2) *Cholesterol*-d-*glucoside*, $C_{27}H_{45}O{\cdot}C_6H_{11}O_5$ (m.p. 285°); (3) *Myricyl*-d-*glucoside*, $C_{30}H_{61}O{\cdot}C_6H_{11}O_5$ (m.p. 99°); (4) *ceryl*-d-*glucoside*, $C_{27}H_{55}O{\cdot}C_6H_{11}O_5$. This compound was obtained in two

modifications, melting at 94° and 135° respectively; and (5) cetyl-*d*-glucoside, $C_{16}H_{33}O \cdot C_6H_{11}O_5$. Although this glucoside was first synthetically prepared by Fischer and Helferich it has now been somewhat more completely characterized.

Stachyose, Presence of, in Leguminous Seeds. G. Tanret. (*Comptes rend.*, 1912, **155,** 1526.) The seeds of *Phaseolus vulgaris* yielded 0·21 per cent. of stachyose and 0·39 per cent. of saccharose. Stachyose was also found in the seeds of *Ervum lens*, *Pisum sativum*, *Trifolium incarnatum*, *Galega officinalis*, *Lupinus luteus*, and *Soja hispida*.

Strophanthic Acid, a Saponin from the Seeds of Strophanthus Gratus. E. Sieburg. (*Berichte Pharm.*, 1913, **23,** 278; *J.S.C.I.*, 1913, **32,** 623.) The haemolytic saponin, strophanthic acid, which Kobert had previously observed as an accidental impurity of commercial strophanthin, is contained in varying proportions up to 0·2 per cent. in all varieties of the drug, from the EtOH extract of which it may be obtained by precipitation with an acid after the removal of the alcohol. The pure saponin, $(C_{21}H_{34}O_{10})_4$, has well marked acid properties, and is precipitated from its solutions in water or alkali by picric or phosphomolybdic acid, and also by concentrated Am_2SO_4 or NaCl solutions. It is readily soluble in aqueous EtOH, but only sparingly in water and Et_2O. With salts of heavy metals it forms precipitates of indefinite composition. On hydrolysis with acids it is resolved finally into dextrose and strophanthigenin $(C_{12}H_{18}O_2)_2 3\frac{1}{2}\ H_2O$, a sapogenol which likewise possesses haemolytic properties.

Strophanthus Glucosides. A. Heffter and F. Sachs (*Chem. Zentralb.*, 1912, **2,** 130; *Pharm. J.*, 1912, **35,** 271.) The amorphous strophanthin of *Strophanthus hispidus* resembles the strophanthin of *S. kombé*, both in its physiological action and in chemical characters. Besides this amorphous strophanthin, the kombé seeds, contain crystalline kombé-strophanthin. Thoms' gratus-strophanthin is only slightly bitter, whereas the other above-named strophanthins are all markedly bitter. Crystalline kombé-strophanthin alone has the property, in a slight degree, of disintegrating the red blood corpuscles. Its toxicity on rabbits is very close to that of the amorphous glucoside, and is less than that of gratus-strophanthin. Crystalline strophanthin from kombé seeds appears to show very little difference in its action on the human subject from the amor-

phous glucoside which accompanies it. The amorphous glucoside isolated from *S. hispidus* seeds, by Thoms' method, is a white powder soluble in water and in EtOH, insoluble in Et_2O. It is precipitated from aqueous solution by ammoniacal basic lead acetate and gives a precipitate with tannin, soluble in excess. It contains no nitrogen. With sulphuric acid it gives an intense green colour. In aqueous 3·484 per cent. solution it has the α_D + 13·9°. It sinters at 160°C., but does not melt at 190°C. It loses 4·29 per cent. of water at 100–105°C. The anhydrous substance has the percentage composition C, 57·27; H, 8·19; CH_3O, 4·36 per cent. Strophanthidin obtained from this by acid hydrolysis is a micro-crystalline white powder of prismatic or hone-shaped crystals. It has a slight reducing action on Fehling's reagent; m.p. at 178–180°C., with decomposition. It contains no methoxyl group. Strophanthin from *S. kombé* is also amorphous, and has similar reactions. It sinters at 170°C.; α_D + 11·87°; it loses 3·84 per cent. of water at 105–110°C. The anhydrous substance has the percentage composition C, 57·51; H, 7·24; CH_3O, 5·67. Its strophanthidin obtained by acid hydrolysis is similar to the above. On treating the calcium carbonate residue from the preparation of this amorphous strophanthin with hot water, well-formed needles of crystalline strophanthin are obtained. This gives the same reactions as the amorphous product. It is soluble in water 1·99 : 100 at 18°C., readily soluble in alcohol, almost insoluble in ether, sparingly soluble in chloroform. It is salted out by ammonium sulphate and precipitated like the amorphous glucoside. It softens at 177° to 181°C.; α_D + 28·72° in 1·951 per cent. aqueous solution. It loses about 2·58 per cent. of water at 105–110°C. The dry substance has the percentage composition C, 61·93; H, 7·64; CH_3O, 4·73. It is identical with the kombé-strophanthin of Arnaud. Its strophanthidin is identical with the strophanthidin obtained from amorphous strophanthins.

Sugar Determination with Fehling's Reagent, wtih K_4FeCy_6 Indicator. E. Selviticl. (*Zeits. analyt. Chem.*, 1912, **50**, 525; *Pharm. Zentralh.*, 1913, **54**, 11.) A 1·5 : 100 solution of K_4FeCy_6 is added to an equal volume of Fehling's reagent. The sugar solution is run into the boiling mixture until the blue colour is discharged and is replaced by the white precipitate of Cu_2FeCy_6.

Swertzia Perennis, Gentiopicrin in. M. Bridel. (*J. Pharm. Chim.*, 1912, **6,** 481.) The small Alpine gentianaceous plant, *Swertzia perennis*, contains gentiopicrin. The glucoside has, up to now, been found in *Gentiana lutea*, *G. pneumonanthe*, *G. asclepiadea*, *G. punctata*, *G. cruciata*, and *Chlora perfoliata*, besides in the above. (See also *Y.B.*, **1906**, 35; **1910,** 108; **1911,** 120.)

Terpene Alcohols, Synthetic β-Glucosides of. J. Haemaelaeinen. (*Biochem. Zeits.*, 1913, **49,** 398; *Chem. Zentralb.*, 1913, **1,** 1604.) The synthetic glucosides of the terpene alcohols are of considerable interest from the biological point of view, since they indicate the method of formation of terpenes in plant life. Also they will probably be found to possess therapeutic value. The author gives the details for preparing, and the characters of a number of glucosides of citronellol, cyclohexanol, the terpineols, dextrodihydrocarveol, and terpene alcohol derivatives.

Trifolium Repens, Presence of HCN in. M. Mirande. (*Comptes rend.*, 1912, **155,** 651.) The wild clover contains a cyanogenetic substance and a ferment, which, by its action, liberates HCN from the tissues when these are bruised and macerated in water. The leaflets collected by the author gave 0·012 per cent.; the petroles 0·0025 per cent.; and the stems 0·001 per cent. The material was obtained from flowering plants, in August. The root examined in September gave no HCN. Probably conditions of soil and cultivation profoundly modify the amount of cyanogenetic material present, for specimens of the herb collected in different districts varied in the yield of HCN from 0·0391 per cent. to 0·0036 per cent. The cyanogenetic substance has not yet been isolated.

Urease in Seeds of Ricinus Communis. K. G. Falk. (*J. Amer. Chem. Soc.*, 1913, 292.) Castor oil seeds contain an enzyme which decompose urea with elimination of NH_3. The ferment is destroyed by heating.

GUMS, OLEORESINS AND RESINS

Acacia Gum, Acidity of. (*Evans' Analyt. Notes*, 1912, **7,** 5.) A sample of mucilage freshly prepared from high grade gum, gave by direct titration (phenolphthalein), acidity equal to about 2·8 per cent. free arabic acid (or 0·35 per cent. of acetic acid).

Acacia Gums, Sudan. S. F. Ward. (*Chem. and Drugg.*, 1913, **82**, 631.) An account of the botanical and geographical sources, the methods of collection, and the commerce of Sudan gum acacia, illustrated with photographs.

Aloes, Detection of, in Admixture with Extracts of Drugs containing Hydroxymethylanthraquinones, and Identification of the latter by the Crystalline Form of the Isolated Hydroxymethylanthraquinones. G. Mossler. (*Pharm. Post*, 1913, **46**, 313, 325; *Chem. Zentralb.*, 1913, **1**, 1842.) The EtOH solution of the material is evaporated, the residue dissolved in water, and the filtered aqueous solution (100 c.c.) heated for ½ hour on the water-bath with 5 c.c. of 10 per cent. H_2SO_4. The H_2SO_4 is then precipitated hot with the exact quantity of $Ba(OH)_2$ and the filtered solution concentrated to 100 c.c., clarified with the least possible quantity of $Pb_2C_2H_3O_2$, and filtered. From 10 c.c. of the filtrate the excess of Pb is removed as $PbSO_4$, and the solution divided into two portions, of which one is extracted with 4–5 c.c. of C_6H_6, and the C_6H_6 solution extracted with dilute AmOH. If the separation of the foreign hydroxymethylanthraquinones by the lead acetate has been complete, the aqueous layer, after settling, should have at the most only a light pink colour. A yellow coloration of the C_6H_6 indicates the presence of aloes. The other portion of the liquid is treated with excess of bromine water: in presence of aloin a flocculent precipitate forms immediately. The main portion of the solution is now freed from Pb and tested for aloin by Hirschsohn's reaction and Schouteten's fluorescence reation: (1) 10 c.c. of the solution is warmed with 1 drop of $CuSO_4$ solution and 1 drop of H_2O_2: aloin is indicated by a red colour which becomes more intense on standing. (2) 10 c.c. of the solution are warmed gently and shaken with 2–3 Gm. of borax and then allowed to stand for ½ hour: the presence of aloes is indicated by a green fluorescence of the solution. It is stated that 0·2 Gm. of extract of aloes may be detected by the above method in 5 Gm. of a mixture of rhubarb, frangula and cascara extracts. Drugs containing hydroxymethylanthraquinones may be identified by isolating the hydroxymethylanthraquinone and determining microscopically the form of the crystals.

Amber Substitutes, Detection of. J. Marcusson and G. Winterfeld. (*Mitt. Kgl. Materialprüfungsamt*, 1912, **30**, 191; *J.S.C.I.*, 1912, **31**, 1138.) Of the substances which are chiefly

used as substitutes, hard Zanzibar copal most resembles amber. It is distinguished from the latter by the absence of succinic acid on distillation, and by its much greater solubility in cajuput oil. Artifically hardened copal, however, prepared according to Spiller's method, may contain succinic acid and is almost insoluble in cajuput oil; it is identified by its low ester value (8·2–9·4) compared with the high ester value of natural and moulded amber (71–112), and by its high acid value (71·4–56·2) compared with the low acid value of amber (15–35). The determination of the acid and ester values of amber, copal, and resins generally, is much simplified by the use of a mixture of equal parts of C_6H_6 and absolute EtOH as solvent, in the place of EtOH only. The determination of the S content yielded an even simpler method of distinguishing between amber and hardened copal. The former contains 0·34–0·42 per cent. of S, whereas three samples of hardened copal contained 0·66, 0·64 and 1 per cent. of S respectively. (See also *Y.B.*, **1911,** 130.)

Asafetida, the "Lead Number" as a Test for. E. F. Harrison and P. A. W. Self. (*Pharm. J.*, 1913 [4], **36,** 218.) On the grounds that certain samples of asafetida have not conformed to an arbitrary official test for the determination of the "lead number," it is stated that several parcels of what are considered by the authors to be asafetida of good quality have been condemned as adulterated by the Customs analysts of the U.S.A. This official test is said to be conducted thus :—

Sufficient of the sample (about 20 Gm. of the U.S.P. drug) is taken to furnish between 5 and 10 Gm. of the resin. The alcohol-insoluble material is determined in the usual manner. The first two filtrates, representing the major part of the sample, are transferred to a casserole, and the EtOH evaporated on the steam-bath. The resin is then dissolved in Et_2O, filtered, transferred to a separator, and washed with water until the aqueous layer separates clear without any milkiness. The Et_2O solution is filtered through a dry paper into a flask or beaker, and the solvent evaporated on the steam-bath.

Into a small tared beaker weigh roughly about 1·1 to 1·2 Gm. of the resin prepared as above, and dry in the air-bath at 110°C. for five hours. Place in a desiccator, cool, and weigh. Dissolve in 20 c.c. of 95 per cent. EtOH, boiling gently until the resin is in solution. Transfer to a graduated 100 c.c. flask, washing the beaker with hot 95 per cent. EtOH, care being

taken that the final volume does not exceed 70 c.c. Add 25 c.c. of the alcoholic lead acetate solution (described below), and allow to stand overnight. Make up to the mark, filter through a fluted paper, and pipette into a beaker an aliquot of 25 c.c., add 10 c.c. of water, and evaporate to 10 c.c.; add 5 c.c. of 10 per cent. H_2SO_4, and then 100 c.c. of EtOH, stirring vigorously to dissolve any separated resin. Filter off the $PbSO_4$ on a tared Gooch crucible, and determine the Pb in the usual way.

Run a blank on the alcoholic lead acetate solution, and calculate the amount of lead absorbed by 1 Gm. of the dried resin. The number of milligrammes of Pb per gramme is the lead number.

A good asafetida should have a lead number of at least 200.

The alcoholic lead acetate solution is thus prepared:—

Dissolve 5 Gm. of lead acetate in 20 c.c. of water, and add 80 c.c. of 95 per cent. EtOH. A turbidity generally results due to the precipitation of lead carbonate caused by the carbon dioxide contained in the alcohol. Allow to stand overnight. The clear supernatant liquid can then be used without filtration for the determination of the lead number.

It will be seen that the "lead number" is thus a measure of the constituent (or constituents) of the ether-soluble portion of the resin which form a lead compound insoluble in alcohol.

The test appears to be a modification of that of Merrill and Seil, who found the following lead numbers for the gum resins named as follows: Asafetida, 222; galbanum, 4; ammoniacum, 75; olibanum, 0; guaiacum, 171; myrrh, 7; colophony, 142; bdellium, 55; sandarac, 351; mastic, 34; gamboge, 9; dragon's blood, 0; euphorbium, 34; "pepper-asafetida," 82.

On applying this test to a number of samples of asafetida, believed to be genuine, from the amount of S found to be present in the essential oil, the authors found that only 4 out of 21 gave the requisite "lead number." A sample in fine tears containing 3·59 per cent. of S in the essential oil had a lead number of only 59. A number of specimens from the Pharmaceutical Society's Museum failed to approach a "lead number" of 200 and one gave but 18. The authors find that different samples from the same parcel of gum give widely different lead numbers; and on various grounds consider that the test is not one on which the genuineness or otherwise of asafetida should be decided. The criterion which the authors advocate, the percentage of essential oil, and the percentage of S in that

oil calculated on the drug, can be recommended from two distinct points of view. In the first place, it is probable that the medicinal and other virtues of asafetida are mainly due to the sulphur-containing constituents of the oil, and therefore the amount of sulphur in the oil, combined with the amount of oil in the drug, is an index of the actual value in use of a given sample. In the second place, both the B.P. and the U.S.P. describe asafetida as "a gum-resin obtained by incision from the root of *Ferula fœtida and probably other species*." There is no indication as to *which* other species give a gum-resin that is entitled to be called asafetida. It is maintained, therefore, that although a given parcel of asafetida may be a mixture of gum from two or more species, if a representative sample of it after mixing contains a proper proportion of oil and that oil contains a proper proportion of sulphur, it ought to be regarded as asafetida. In other words, if the sulphur in the oil, expressed as a percentage of the real gum-resin, does not fall below a certain minimum, it is evidence of the genuineness of the drug. As to what that minimum should be, the question is more or less open. The authors adhere to their previously proposed minimum of 1·5 per cent. (See also *Y.B.*, **1911,** 127; **1912,** 71, 132, 133, 417.)

Asafetida, "Lead Number" of. J. R. Rippetoe. (*Amer. J. Pharm.*, 1913, **85,** 199.) The author confirms the results of Parry, Harrison and Self, as to the unreliability of the official U.S. Bureau of Chemistry "lead number" test for determining the value of asafetida, having obtained results varying as much as 66 per cent. with the same sample of gum in tears. Details of the methods employed and of a large number of results obtained are given, which prove that the method is liable to considerable variation.

Asafetida, Valueless Significance of the "Lead Number" of. E. J. Parry. (*Chem. and Drugg.*, 1913, **82**, 34.) The author protests most strongly against attaching any significance to the "lead number" for asafetida or other kindred drugs of naturally indefinite composition. The lead value is stigmatized as a "ridiculous figure." It is pointed out that the lead value is so easily "adjusted" by sophistication that there is no difficulty in preparing samples of these drugs or compounds to meet the requirements of the U.S. Bureau of Chemistry. A number of

obviously genuine parcels of asafetida have recently been rejected by the American authorities because they failed to pass this arbitrary and erroneous test.

Canada Balsam. (*Evans' Analyt. Notes*, 1912, **7,** 18.) Seven samples were examined, gave: Acid value, 79·6 to 84; ester value, 5·6 to 13·1; saponification value, 87·5 to 92·7; $\eta_{D20°}$ 1·5194 to 1·523.

The two somewhat abnormal samples below were not entirely soluble in hot absolute EtOH: Acid value, 98, 84; ester value, 8·4, 7·0; saponification value, 106·4, 91; $\eta_{D20°}$, 1·5194, 1·522.

Guaiacum Resin, Commercial, Characters of. (*Evans' Analyt. Notes*, 1912, **7,** 37.) Four samples of guaiacum resin gave the following results: Ash, 5·7, 3·7, 1·7 and 11·7 per cent.; insoluble in EtOH 90 per cent., 29·5, 20, 9·5 and 28·7 per cent.; acid value, 44·8, 56, 53·2, 45. The pure resins extracted by EtOH from the above had the acid values, 63, 66, 56 and 65; and the Hübl values, 67, 44 and 57·9.

Guaiacum Resin. (*Southall's Report*, 1913, **21,** 12.) Five samples of the block resin have been examined, one alone of which gave a satisfactory percentage soluble in alcohol (90 per cent.). The figures obtained ranged from 72·88 to 97·2 per cent.

Kino. (*Southall's Report*, 1913, **21,** 14.) Great difficulty has been experienced in obtaining satisfactory supplies of this drug; of eleven samples examined, only one yielded the prescribed amount of 80 per cent. soluble in boiling water. The actual figures obtained ranged from 32·03 to 83·62 per cent.

Larch Turpentine (Venice Turpentine), and its Oil, Characters of. (*Schimmels' Report*, Oct., 1912, 111.) An authentic sample of oleoresin of Larch turpentine was clear, faintly yellow, and almost liquid; α_D + 29°20′; acid value, 69·5; ester value, 55·9; soluble 1 : 3 in EtOH 80 per cent.; entirely soluble in petroleum ether, except a few flakes. Yield of essential oil by steam distillation, 13·5 per cent.; α_D — 8°15′; sp. gr., 0·8649; $\alpha_{D20°}$ 1,46924; acid value, 0; ester value, 5·9; soluble 1 : 6 and more of alcohol 90 per cent.

Peruvian Balsam, Analysis of. H. R. Jensen. (*Pharm.*

J., 1913, [4,] **36,** 210.) It is suggested that the iodine value of the "cinnamein" and the α_D of the first 30 per cent. fraction on distillation should be determined, in addition to the tests usually performed. By these means the addition of synthetic cinnamein, benzl benzoate, or sophistication with storax may be detected. Definite conclusions, however, cannot be made for lack of authentic specimens of genuine Peruvian balsams. The results of the examination of samples of the drug are given. (See also *Y.B.*, **1912,** 141.)

Pinus Cambodgiana, Oleoresin of. A. Wichmann. (*Archiv. Pharm.*, 1912, **250,** 472.) The exudation is a dirty yellowish, opaque, honey-like mass, with a pleasant, aromatic, turpentine-like odour, and a slightly bitter taste. It is soluble in most organic solvents, but gives a turbid solution in wood spirit, petroleum ether and benzol. Acid value, direct 145·3, indirectly. 148·1; saponification value, 0·1. It yields about 20 per cent. of pale yellow turpentine oil to steam distillation: sp. gr. 0·892; $\eta_{D^{21°}}$ 1,48455. It resinifies on exposure to the air. The resin, free from oil, in ether solution; gives to ammonium carbonate solution about 14 per cent. of amorphous *cambopinenic acid*, $C_{11}H_{18}O_2$, sintering at 70° and melting at 78°C. After removing this, another amorphous acid, *cambopinonic acid*, $C_{16}H_{24}O_2$, is obtained to the extent of 58 per cent. on shaking out with 1 : 100 Na_2CO_3 solution. It sinters at 62°C. and melts at 71°C. After removing these acids, *camboresene* remains as a soft, pale yellow, amorphous mass.

Pinus Halapensis Oleoresin. — Reutter. (*J. Pharm. Chim.*, 1912, **6,** 497.) The oleoresin examined was derived from Planchon's botanical garden in Montpellier. It differed in character from similar products previously examined by Tschirch and also by the author. It occurred in a pale yellow, faintly terebinthinous, solid mass, showing micro-crystals. Soluble in most organic solvents: about 75 per cent. was soluble in Et_2O and in C_6H_6. The Et_2O solution gave 19 per cent. of acids, removed on agitation with Am_2CO_3 solution. This was mainly *helepinic acid*, $C_{20}H_{40}O_4$, amorphous, m.p., 73·5 to 74·5. By Na_2CO_3 solution 53 per cent. of acids were separated. They comprised crystalline helepinolic acid, $C_{10}M_{56}O_5$, m.p. 144·2 to 145·5°C.; amorphous *α-helepinolic acid*, $C_{34}H_{56}O_4$, m.p. 80·5 to 81·5; amorphous *β-helepinolic acid*, $C_{18}H_{28}O_4$, m.p.

80·5 to 82°C.; and crystalline *heleponic acid*, $C_{37}H_{58}O_4$, m.p. 156–157°C. Besides these, 14·4 per cent of essential oil and 6·6 per cent. of resene were present.

Pinus Pinea, Oleoresin of. L. Reutter. (*J. Pharm. Chim.*, 1912, **6**, 494.) The ether-soluble portion of the oleoresin yields to ammonium carbonate solution, 18 per cent. of *pineic acid*, $C_7H_{11}O_{17}$ m.p. 99 to 99·5°C.; not obtained crystalline. To Na_3CO_3 solution it gave 37 per cent. of mixed acids, from which a crystalline *pineolic acid*, $C_{18}H_{28}O_3$, was separated, m.p. 86°C. Besides these the oleoresin gave 18 per cent. of *pinearesene* and 12 per cent. of essential oil. The original oleoresin occurs in yellowish or reddish, slightly fragrant tears; m.p. 85°C.; acid value, 101·7 to 102·5; saponification value, 269·27 to 270·1. Sparingly soluble in petroleum ether; 66 per cent. is dissolved by Et_2O 75 per cent. by $CHCl_3$; 80 per cent. by CS_2. All these solutions are pinkish; but that in EtOH, in which it is also soluble, is yellow.

Resins and Oleoresins, Resenes of. C. H. Henty and W. S. Dickson. (*J. Ind. Eng. Chem.*, 1912, **4**, 495.) The determination of resene in a series of resins from different species of *Pinus*, was carried out as follows. About 2 Gm. was dissolved in a considerable excess of N/2 alcoholic KOH, allowed to stand at room temperature for 18 hours, diluted with water until separation of the resene began and the solution cleared by the addition of a small quantity of 95 per cent. EtOH. This solution was then extracted three times with petroleum ether, boiling below 40°C. The combined extracts were shaken out with 50 per cent. EtOH to remove slight amounts of dissolved potassium salts of resin acids. After drawing off the petroleum ether extract into a weighed glass evaporating dish, it was allowed to evaporate spontaneously to constant weight.

The following were the percentage of resene found in the species named: *Pinus taeda*, 4·10 per cent.; *P. palustris*, 5·67 per cent.; *P. maritima*, 7·37 per cent.; *P. heterophylla*, 7·38 per cent.; *P. serotina*, 7·65 per cent.; *P. echinata*, 8·71 per cent,; species unknown, 8·94 per cent.; *P. sabiniana*, 9·66 per cent.; *P. laricio*, 14·05 per cent.

The resin of *P. laricio* was from Austria and that of *P. maritima* from France. The others were all from American species.

Shellac, A Rapid Microscopical Method for the Determination of Arsenic, as Orpiment, in. R. Schwarz. (*J. Ind. Eng. Chem.*, 1912, **4**, 660.) Almost all shipments of so-called "arsenic-free" shellac contain from small amounts to considerable quantities of arsenic, mostly in the form of orpiment. This may be rapidly and certainly detected microscopically, by the characteristic crystalline, yellowish-green, imperfect crystals or crystalline masses observed in the residue, insoluble in MeOH.

A 10 Gm. average sample is ground fine in a coffee mill and dissolved in 15 c.c. of MeOH by warming. The varnish is then poured into a centrifuge tube and centrifugated for 5 to 6 minutes. The varnish is then decanted, the precipitate shaken with MeOH and the tube again revolved in the centrifuge for one to two minutes. The MeOH is then decanted as thoroughly as possible, the amount of the precipitate recorded, and a small portion transferred to a micro-slide tube. This preparation is then carefully examined under the microscope, using a magnification of 450–600 diameters. With an ordinary shellac or varnish containing a normal amount of insoluble material and above 150 parts of arsenic per million, several pieces of orpiment will be observed in each field. Some shellacs, however, contain a considerable amount of insoluble material, and so the precipitate becomes larger and the number of pieces of orpiment in each field correspondingly smaller. The method has been used not only on the common grades of shellac, but on so-called "arsenic free" shipments and three bleached shellacs. The results of all tests are embodied in a table in which is given the amount of the precipitate, number of pieces of orpiment found in each field or preparation, and the amount of As_2O_3, as determined by the Marsh or Gutzeit test. The Marsh or Gutzeit test determines the total amount of arsenic present, and therefore, as a certain amount of orpiment may be dissolved in the shellac, it is not surprising that in some instances the microscopic tests failed to reveal orpiment, while the chemical tests showed appreciable amounts of A_2O_3 to be present.

The sediment from a brewers' varnish made from ordinary grades of shellac, contains so much orpiment that there are always one or more crystals present in each micro-field. Of raw or purified shellacs all but two examined showed crystals of orpiment. Crystals of orpiment have been found in samples showing only 4 : 1,000,000 of As_2O_3 by Gutzeit's test, or even less.

Storax, Liquid, Examination of. C. Ahrens. (*Zeitschr. Œffrent. Chem.*, 1912, 267; *Apoth. Zeit.*, 1912, **27**, 651.) About 30 Gm. of the well mixed sample is spread out on a flat tin, then freed from adhering moisture by means of a sheet of bibulous paper laid on the surface. The 4 to 5 Gm. is weighed off, by difference, into a small porcelain capsule and mixed with 5 Gm. of washed sand. The mixture is then triturated with petroleum benzin, sp. gr. 0·650, b.p. 70°C., added in small quantities at a time and decanted through a filter, until a powdery residue remains. After washing the capsule and filter with more petroleum benzin, the bulked liquid is again filtered into a tared flask. The solvent is then distilled off, and the residue is dried in the drying oven until two consecutive weighings at 15 minutes' interval are identical. With normal storax this residue should be pale yellow, very viscous but yet distinctly fluid. Its odour is unpleasant. In presence of much colophony the residue is dark in colour, not semi-fluid, and has a characteristic resinous odour. In genuine storax the amount varies from 37 to 56 per cent. with a mean of 45·2 per cent. This has an acid value of 191·3 to 203·3 or a mean of 196·1. Besides resin, olive and castor oils are probable adulterants. The determination of the iodine value of the petroleum ether residue is likely to give useful data. The moisture of storax is best determined indirectly thus: From 4 to 5 Gm. of the sample is weighed off and rubbed with anhydrous Na_2SO_4 in a capsule, and then extracted by trituration with Et_2O. The Et_2O extract is passed through a tared filter into a 100 c.c. graduated flask. The capsule and filter are then washed with sufficient Et_2O to bring the final volume up to 100 c.c. This is shaken with a little anhydrous Na_2SO_4, and 50 c.c. pipetted off into a tared flask, is distilled off, dried and weighed. The original Na_2SO_4 is then treated with water, and its solution passed through the tared filter, which is washed, dried and weighed. The weight of the ether residue $\times$ 2 + the increased weight of the filter gives the amount of dry matter present. This deducted from the original weight gives the moisture.

Tolu Balsam. (*Evans' Analyt. Notes*, 1912, 7, 76.) Twenty samples have been examined, several of which were badly adulterated. The first nine samples having the typical analyses given are considered to be genuine.

	Free Acid per cent.	Combined Acid per cent.	Acid Value.	Ester Value.	Sapon. Value.	Iodine Value.	Storch-M. Colophony Test.	Ref. Index. 60°.	Condition.
1	7·1	37·7	111·2	77·4	188·6	64·4	Nil	—	Soft
2	7·3	29·2	116·2	88·1	204·3	65·9	,,	1·593	,,
3	8·3	33·5	—	—	190·5	71·8	,,	—	Brittle
4	10·3	27·3	—	—	—	54·1	,,	—	,,
5	10·6	28·4	—	—	—	57·9	,,	—	,,
6	12·7	22·4	—	—	—	44·1	,,	—	,,
7	15·5	25	119	71·6	190·6	64·3	,,	1·595	,,
8	15·9	23·8	111·3	83·0	194·3	63·3	,,	—	,,
9	16·3	22·4	126	70·0	196	40·9	,,	—	,,
10	13·6	12·2	120	66·2	186·2	90·7	Positive	—	Brittle, red
11	14·3	14·8	119	68	187	82·7	,,	1·57	,,
12	15·7	12·1	—	—	—	63	,,	—	,,

The last three samples were adulterated with rosin.

The free acid figure, obtained from a chloroform extraction is, of course, distinct from the acid value. It will be similarly observed that the saponification value of the entire product owing to variations of the contained resin, is not as useful as the combined cinnamic acid figure.

The acid values have been obtained by the indirect Merck-Fleissig method, considerable dilution with water being effected before back titrating the excess of alcoholic KOH used: a direct titration without water has been found to give an acid value 5 per cent. higher (and ester value reduced correspondingly); in presence of rosin this increase rose to 9 per cent. Saponification values were also obtained by diluting with water previous to titration. Some of the soft extracts otherwise normal do not conform to the indefinite CS_2 test now recognized solely by the B.P. 1898,

Tolu Balsam. (*Southall's Report*, 1913, **21**, 24.) Some difficulty has been experienced in obtaining satisfactory samples of Tolu balsam. Eleven parcels have been assayed, with 8 of these the results, although showing much variation, are characteristic of the genuine balsam. With the other three, however, adulteration with colophony was evidenced by the high acid value, brown colour and intense reaction with the *Storch-Morawski* test.

The figures for the latter three samples were :—

Soluble in alcohol (90 per cent.), 89·60, 94·71, 95·48 per cent.; free balsamic acid calculated as benzoic acid, 18·47, 17·61, 14·16 per cent.; combined balsamic acid calculated as benzoic acid, 8·66, 10·83, 9·20 per cent.

Tragacanth Powder, Detection of Sterculia Gum in. E. Schaer. (*Gehe's Report; Pharm. Zeit.*, 1913, **58,** 328.) Two Gm. of the powder is shaken in a 100 c.c. cylinder with a little alcohol; then 50 c.c. of water is added and the mixture is shaken to produce a uniform mucilage. To this 50 c.c. of 4 per cent. solution of borax is added and allowed to stand over night. If the tragacanth be pure the mucilage, when poured, will form no mucus-like threads. In the presence of the gum of *Sterculia urens*, a tenacious mucilage, stronging when poured, is obtained.

Tragacanth Testing. H. R. Jensen. (*Chem. and Drugg.*, 1913, **82,** 576.) Since acacia has practically no free acid constituents, whereas in tragacanth the acidity is marked, and is, moreover, proportional to the adhesive power of the mucilage made from the gum, the author suggests that the determination of the acid value may afford a useful criterion of the value of tragacanth. The gum should be in the finest possible powder. In lump gum the grade cannot be conveniently reduced finer than No. 90; but when practicable 160 powder should be used. Of this 1·5 Gm. is heated with 30 c.c. of N/2 KOH for 1 hour under a reflux condenser, and the resulting saponification value determined, in the usual manner, by back titration with N/2 acid, using N/2 acid and spotting out with phenolphthalein indicator. Also, the viscosity of the mucilage of standard gum strength should be determined. Payet (*Y.B.*, **1906,** 78) has suggested that the presence of oxydases and of peroxydases indicates admixture with acacia. The author finds, however, that these may be present in whole gum, powdered only for analysis. Their presence may be due to fermentative changes during drying. The more highly coloured gums give the strongest enzyme reactions.

The results of some of the experiments are summarized on opposite page.

The samples 5 to 12 were all second grade, and of these Nos. 8, 10 and 12 were found to have a very low viscosity. It will be observed that oxydases predominate. Starches other than the natural were not identified, but rough estimations showed

	No. of Powder.	Sapon. Value.	Sapon. Value. calculated to dry.	Water.	Starch.	Oxydases. Gaiacum Reaction.	Peroxydases. Guaiacol Reaction.
1	160	154·6	186	16·9	Pr. abs.	Absent	Absent
2	160	141	166	15·1	,,	,,	,,
3	90	128	155·3	17·6	,,	,,	,,
4	90	123	139·5	11·8	,,	,,	,,
5	160	93	109·5	15·5	V. slight	Distinct	—
6	90	83·8	98	14·5	,,	,,	Slight
7	90	76	87	13·6	—	Marked	,,
8	160	72	83	13·2	Slight	,,	,,
9	90	65·4	76·7	14·7	Marked	Slight	Absent
10	160	63	70	10	Slight	Marked	—
11	90	54·1	63	13·7	Absent	Slight	V. slight
12	90	51·5	60	13·4	Marked	Marked	Marked

a content of about 5 per cent. in some of the samples. Four samples of acacia gums were found to have saponification values of from 6·3 to 8·5 (average 10 on the dry), all, of course, giving marked enzyme reactions. Of Indian tragacanths, one authentic sample of *Cochlospermum gossypium* gum had the saponification value 122·7 (in No. 90 powder), it gave no reactions for oxidizing enzymes, nor did a sample of true *Sterculia urens* gum.

Tragacanth, Volatile Acidity of, Compared with that of Indian Gum. W. O. Emery. (*Amer. J. Pharm.*, 1913, **84,** 393.) The amount of acetic acid is known to be greater in the gums of *Sterculia urens* and *Cochlospermum gossypium*, known commercially as Indian Gums, than in gum tragacanth. The author suggests that this acidity should be determined and expressed by an arbitrary figure, which he is pleased to name the "volatile acidity"; that is, the number of c.c. of N/10 KOH required to neutralize the volatile acid obtained, by subjecting the products of the action of H_3PO_4 on 1 Gm. of gum to distillation with steam.

The test is conducted thus :—

One Gm. of the sample is macerated in a 700 c.c. round-bottomed flask, provided with a long neck, for several hours in the cold with 100 c.c. of distilled water and 5 c.c. of syrupy H_3PO_4 until the gum is completely swollen. The mixture is boiled gently for 2 hours under a reflux condenser, and then distilled in a current of steam until 600 c.c. of distillate has been collected. A spray trap should be used to prevent traces of H_3PO_4 from being carried over into the distillate. The

distillate is then titrated with N/10 KOH and phenolphthalein indicator. The number of c.c. used up is the author's volatile acidity. (This figure might be better expressed as percentage of volatile acid, in terms of acetic acid.) With whole tragacanth the "volatile acidity" ranged from 3·2 to 4·2 in 35 samples, or a mean of 3·6. Twenty-one samples of powdered gum gave figures ranging from 3·4 to 4·1 and a mean of 3·7. Sterculia whole gum treated in a similar manner, the "volatile acidity" ranged from 26·1 to 28·3, with a mean of 26·7. This corresponds to 15·91 per cent. of acetic acid calculated on the original gum. Powdered Indian gum gave a volatile acidity ranging from 25·4 to 27·7, the average being 26·5, equivalent to 15·79 per cent. of acetic acid.

Venice Turpentine, Fallacy of Walbum's Test for. (*Schimmels' Report*, Oct., 1912, 112.) It is found that Walbum's test (*Y.B.*, **1908,** 205) is not reliable. An authentic sample of larch turpentine (Venice turpentine) when dissolved in ether and treated with AmOH under the conditions of the test, failed to form more than a partial jelly in 24 hours, instead of forming a jelly in 11 minutes as stated.

INORGANIC CHEMISTRY

Amalgamated Al as a Source of H for Marsh's Test. Kohn Abrest. (*Annales des Falsificat.; Répertoire*, 1912, **24,** 451.) Aluminium foil, 4 Gm., cut in pieces weighing about 0·6 Gm. each, is cleaned with HNO_3, then immersed for 3 minutes in 25 c.c. of a 1 : 100 solution of $HgCl_2$. The amalgamated pieces are first thoroughly washed in water, then introduced into 200 c.c. of water in a 250 c.c. flask of a Marsh's apparatus. After evolution of gas has proceeded for 2 hours, the solution to be tested, which should be nearly neutral, and not exceed 20 c.c. in volume, is introduced, and the gas evolved is tested for As in the usual manner. At present, the method has not been made very sensitive, since it will not detect less than 0·5 Mgm. of As in the 20 c.c. of liquid used. It is not, therefore, suitable for toxicological work, but is a convenient process for industrial testing for As. The above method of preparing the amalgam should be adhered to, as the rate of evolution of H is markedly influenced by the condition of the metals. If the Al is too finely divided, the gas is given off too

rapidly. If too little water is used, a magma of alumina hinders gas formation.

Ammonia, Rapid Method for Determining without Distillation, and for the Determination of Formaldehyde. — Gaillot. (*Annales Chim. Analyt.*, 1913, **18,** 15, 17.) The following method depends on the fact that formaldehyde decomposes ammonium salts, combining with the base to form hexamethylene tetramine, and liberating an equivalent of free acid. The author finds it to be specially convenient for the determination of N as NH_3 in manures. Five Gm. of the material is treated with water, and the mixture is made up to 100 c.c. Twenty c.c. (= 1 Gm.) is filtered, a few drops of phenolphthalein added, and exactly neutralized with either KOH or H_2SO_4. Then 5 c.c. of previously neutralized 40 per cent. formalin solution is added, and the free acid is titrated with N/KOH solution. Each c.c. of this = 0·014 Gm. of N as NH_3. To save calculation a standard KOH solution is prepared equivalent to 35 Gm. of H_2SO_4 in 1 litre. Of this 1 c.c. = 0·01 of N as NH_3. When operating on 1 Gm. of substance, as above, each c.c. used = 1 per cent. of N.

In the same manner, employing a known weight of neutralized formaldehyde solution and adding to it a perfectly neutral ammonium salt, the amount of acid liberated will be the exact equivalent of the formaldehyde present. This is then titrated with N/KOH solution, each c.c. of which is equivalent to 0·045 Gm. of H·CHO.

Ammonia, Colorimetric Determination of. P. Thomas. (*Bull. Soc. Chim.*, 1912, **11,** 796.) The blue colour given by NH_3 in presence of phenol and an alkali hypochlorite, noticed by Berthelot in 1859, is extremely sensitive and better suited for the colorimetric determination of NH_3 than the Nessler reaction usually so employed. A standard solution of AmCl 1 : 10,000 is used, with a solution of phenol 4 : 100 ; and solution of chlorinated potash (or soda) 1, and water 9. The phenol and chlorinated solution are added to the ammonia solution to be tested, and the colour allowed to develop. This is then matched with the standard AmCl solution under similar conditions, as in nesslerizing, or with a tintometer. The method is applicable to the ammonia determinations of water analysis.

Ammoniated Mercury, Determination of Hg in. G. A. Sutterheim. (*Pharm. Weekblad.; Pharm. Zentralh.*, **1913,**

54, 307.) *Gravimetric.*—To a weighed quantity of powdered white precipitate, 0·5 Gm. of KCN and a few c.c. of water are added. When dissolved, 5 c.c. of a 13 : 100 solution of NaOH is added, and the liquid is heated on the water-bath until all the NH_3 has been driven off. The precipitated HgO is then reduced to Hg by means of 10 c.c. of formaldehyde solution. The Hg is washed with water, EtOH and Et_2O on a tared filter and weighed when dry.

Volumetric.—0·2 Gm. of the finely powdered white precipitate is heated on the water-bath with 3 c.c. of NaOH and 5 c.c. of water, until all NH_3 is driven off. After cooling, add an excess of N/2 KCN solution (about 12 c.c.). When the HgO has dissolved, HNO_3 is cautiously added until the liquid is only faintly alkaline to phenolphthalein. The liquid is then titrated with N/10 $AgNO_3$. The quantity of HCN combined $\times \frac{200}{54}$ gives the equivalent of Hg present.

Ammonium Phosphate adulterated with NaCl. (*Southall's Report*, 1913, **21,** 37.) A sample of cheap ammonium phosphate was found to contain much NaCl and only about 37 per cent. of $NH_4H_2PO_4$.

Arsenic, Detection of, in the Medicinal Cacodylates. J. Favrel. (*L'Union Pharm.*, 1913, **54,** 234.) One c.c. of the solution suspected to contain organic arsenical compounds is added to 15 c.c. of H_2SO_4, sp. gr. 1·53. It is important that the acid should be exactly of the prescribed strength. Then 10 c.c. of 1 : 10 solution of KI is added. In presence of As, a yellow precipitate of AsI_3 will be at once formed; or if less than 0·02 Mgm. of As_2O_3 is present, only a yellow turbidity. Pb, Sn or Sb, if present, will also give yellow precipitates under similar conditions. These iodides are, however, soluble in HCl; AsI_3 is insoluble in that acid.

Arsenic, Determination of. R. Smith. (*U.S. Dept. Agr., Bur. Chem., Circ.*, 102; *Chem. Abstr. Amer. Chem. Soc.*, 1912 **6,** 3381.) The author uses $HgBr_2$ instead of $HgCl_2$ for sensitizing the paper, and KI and $SnCl_2$ for reduction of arsenates to arsenites in the modified Gutzeit method. For the determination of larger amounts, from 200 Mgm. to 10 Mgm., a new method is proposed. The arsine from generator is passed into a $HgCl_2$ solution, forming As_2O_3 and HgCl after boiling. The precipitate of HgCl is filtered on a Gooch, washed and dried. One Mgm.

of As_2O_3 is equivalent to 14·26 Mgm. of HgCl. The A_2O_3 in the filtrate may also be titrated. For the separation of As from large quantities of organic and inorganic materials, a large excess of Na_2HPO_4 is added to the As in the highest state of oxidation, and precipitation made with magnesia mixture. This method of precipitation of As has been checked on amounts from 1 to 70 Mgm., and has been applied in analysis of gelatin, phosphate baking powders, shellac and dyes.

Arsenic Limits for Drugs in Canada. (*Pharm. J.*, 1913 [4], **35,** 804.) The following limits for As_2O_3 have been established in Canada by an Order in Council, issued in accordance with the provisions of Section 26 of the "Adulteration of Foods, etc., Act":—

Citric acid, 1 part per million; cream of tartar, 1 part per million; tartaric acid, 2 parts per million; bicarbonate of soda, 2 parts per million; phosphoric acid, 5 parts per million; phosphate of lime, 5 parts per million; phosphate of soda, 5 parts per million; boric acid, 4 parts per million; baking powders, 2 parts per million.

The above-named articles are to be declared to be adulterated when found to contain A_2O_3 in excess of the amounts specified. The standards above defined came into effect on December 2, 1912.

Arsenic, Presence of, in Vegetable Tissues. F. Jadin and A. Astruc. (*J. Pharm. Chim.*, 1912, **6,** 529.) As appears to be almost a universal constituent of vegetable tissues. It probably plays an important part in the protoplasmic life of the plant. Although so widely distributed, its amount, however, is very variable in different species. Even parasites such as the mistletoes, which are not in direct contact with the soil, contain As. There is no connexion in the case of parasites with the amount of As in the former and in the host. In recording results the ratio of As is expressed in terms of dry material, since this shows more definitely the comparative As value of the tissues of different plants, or groups of plants. The results thus expressed for different individuals of the same species are often very constant. In the case of mistletoes, this is so, although the proportion of As in the various hosts varies widely. But this approximation in amount, although true of species, does not apply to genera. In a single family enormous differences

may occur in different species. In the individual plant, the organs containing chlorophyll are richest in As. Culinary vegetables and fresh or dry edible fruits always contain As. Consequently, they are at least one of the sources of the As found in animal organs.

Arsenium, Detection of, with Bettendorf's Reagent. L. Winkler. (*Zeits. angew. Chem.*, 1913, 143; *Apoth. Zeit.*, 1913, **28,** 198.) To prepare the reagent, $SnCl_2$, $2H_2O$, 100 Gm., in unaltered transparent crystals, is dissolved in sufficient strong HCl to make 1 litre. After a few days this will develop a brownish tint, due to traces of As. After standing it should become colourless by the deposit of brown flocks, or this may be hastened by adding about 1 Gm. of powdered glass, shaking up and allowing to settle. When the reagent is quite clear and colourless it should be decanted off into small stoppered bottles. To test a liquid for As, about 2 c.c. is heated to boiling with 10 c.c. of the reagent. The mixture is set aside for half an hour. In the case of strong H_2SO_4, 1 c.c. is diluted with 1 c.c. of water before applying the above test. The limit for the reaction in HCl is about 1 of As_2O_3 in 1,000,000.

Atomic Weights, International, for 1913. (*Apoth. Zeit.*, 1913, **28,** 63.) Ag, silver, 107·88; Al, aluminium, 27·1; Ar, argon, 39·88; As, arsenium, 74·96; Au, gold, 197·2; B, boron, 11·0; Ba, barium, 137·37; Be, beryllium, 9·1; Bi, bismuth, 208·0; Br, bromine, 79·92; C, carbon, 12·00; Ca, calcium, 40·07; Cd, cadmium, 112·40; Ce, cerium, 140·25; Cl, chlorine, 35·46; Co, cobalt, 58·97; Cr, chromium, 52·0; Cs, caesium, 132·81; Cu, copper, 63·57; Dy, dysprosium, 162·5; Er, erbium, 167·7; Eu, europium, 152·0; F, fluorine, 19·0; Fe, iron, 55·84; Ga, gallium, 69·9; Gd, gadolinium, 157·3; Ge, germanium, 72·5; H, hydrogen, 1·008; He, helium, 3·99; Hg, mercury, 200·6; Ho, holmium, 163·5; In, indium, 114·8; Ir, iridium, 193·1; I, iodine, 126·92; K, potassium, 39·10; Kr, krypton, 82·92; La, lanthanum, 139·0; Li, lithium, 6·94; Lu, lutetium, 174·0; Mg, magnesium, 24·32; Mn, manganese, 54·93; Mo, molybdenum, 96·0; N, nitrogen, 14·01; Na, sodium, 23·00; Nb, niobium, 93·5; Nd, neodymium, 144·3; Ne, neon, 20·2; Ni, nickel, 58·68; Nt, niton, 222·4; O, oxygen, 16·00; Os, osmium, 190·9; P, phosphorus, 31·04; Pb, lead, 207·10; Pd, palladium, 106·7; Pr, praseodymium, 140·6; Pt, platinum, 195·2; Ra, radium, 226·4;

Rb, rubidium, 85·45; Rh, rhodium, 102·9; Ru, ruthenium, 101·7; S, sulphur, 32·07; Sb, antimony, 120·2; Sc, scandium, 44·1; Se, selenium, 79·2; Si, silicon, 28·3; Sm, samarium, 150·4; Sn, tin, 119·0; Sr, strontium, 87·63; Ta, tantalium, 181·5; Tb, terbium, 159·2; Te, tellurium, 127·5; Th, thorium, 232·4; Ti, titanium, 48·1; Tl, thallium, 204·0; Tu, thulium, 168·5; U, uranium, 238·5; V, vanadium, 51·0; W, tungsten, 184·0; X, xenon, 130·2; Y, yttrium, 89·0; Yb, ytterbium, 172·0; Zn, zinc, 65·37; Zr, zirconium, 90·6.

Barium, Occurrence of, in Tobacco and other Plants. J. S. McHargue. (*J. Amer. Chem. Soc.*, 1913, **35,** 826.) Ba has been previously recorded as a constituent of the ash of many plants. Crawford attributes the poisonous properties of loco weed on stock to the presence of Ba, which contains 0·043 per cent. of $BaSO_4$ on the dry material. The author finds that Ba in small amounts is widely disseminated through rocks, soils and plants. In tobacco, the Ba varies from the normal content of other plants, both wild and cultivated, to approximately twice the maximum reported in loco weed. Some of the Ba occurring in tobacco can be extracted by distilled water, and is probably in combination with organic acids. The occurrence of Ba in the live cells of the higher plants suggests that possibly this metal may function in metabolism. Tables are given of the results of a long series of analyses.

Bismuth Subnitrate, Formula, Characters, and Tests for, of the French Codex. M. François. (*J. Pharm. Chim.*, 1912, **6,** 536.) The formula given in the French codex $BiNO_3(OH)_2$ is stated to correspond to 76·3 per cent. of Bi_2O_3; 5·9 per cent. of H_2O; and 20·7 per cent. of HNO_3. As a matter of fact, the commercial salt is sometimes anhydrous; and the majority of samples contain 1 to 1·5 per cent. of H_2O, and the highest examined by the author contained but 2·02 per cent. of H_2O. This is due to dehydration, either from drying the salt at a too high temperature, or to gradual loss of water at normal temperatures. As a consequence these salts give too high figures for HNO_3 and for Bi_2O_3. It is suggested that the results of the determination of acid should be expressed in terms of N_2O_5 and not in those of HNO_3 as at present. The composition of the pure anhydrous salt would then be: Bi_2O_3, 81·118; N_2O_5, 18·881; or adopting the official hydrated salt, H_2O, 5·921; Bi_2O_3 76·315; N_2O_5, 17·763. The ratio between

the Bi_2O_3 and the N_2O_5 would then be evident, and constant, namely 4·296, whatever the degree of hydration. The formula might be expressed as $Bi_2O_3 \cdot N_2O_5 \cdot 2H_2O$.

Borax. (*Evans' Analyt. Notes*, 1912, **7,** 15.) In 83 samples tested, the best qualities always contained below 5 parts per million of As_2O_3, six samples in fact being practically free. Of commercial grades 11 samples contained 6 to 15 parts per million, and six 50 to 100 parts per million of As_2O_3; this increase is said to be due to different sources of supply of the native mineral. Care is necessary in purchasing borax for pharmaceutical purposes as suitable raw material is said to be scarce.

Boric Acid. (*Evans' Analyt. Notes*, 1912, **7,** 15.) Of 132 samples tested, two contained 20 and 36 parts per million of As_2O_3, an excessive amount. This substance is, on the whole, practically free from such contamination and also from metallic impurities.

Boric Acid, Detection of, in Minute Traces, by Means of Tincture of Mimosa Flowers. L. Robin. (*Bull. Soc. Chim.*, 1913 [4], **13,** 602.) The author repeats the work already reported (*Y.B.*, **1905,** 50). The test for boric acid, with mimosa flowers, is exceedingly delicate, when carried out with the precautions described. It will detect 0·00027 Gm. of boric acid.

Br, Free, Sensitive Reaction for. G. Denigès. (*L'Union Pharm.*, 1912, **53,** 481.) Rosaniline bisulphite reagent, 2 c.c.; H_2O_2, 2 to 10 vols., 2 c.c.; $CHCl_3$, 1 c.c.; and from 1 drop to several c.c. of the liquid to be tested are briskly shaken together in a test-tube. On separating, the $CHCl_3$ will have a more or less pronounced amethyst shade if Br is present, and will show very characteristic absorption bands. As little as 0·00001 Gm. of free Br may be detected thus. Cl under like conditions gives a red colour, the absorption bands of which are quite different from those resulting from the Br reaction. The bisulphite reagent may be prepared as follows: to 1,000 c.c. of a 1 : 1,000 aqueous solution of fuchsine add 10 c.c. of solution of $NaHSO_3$, sp. gr. 1·26 to 1·29. In 5 minutes, add 20 c.c. of pure HCl, sp. gr. 1·18, and set aside for 1 to 2 hours.

Bromine, New Reaction for. I. Guareschi. (*Giorn. farm. Chim.*, **61,** 392; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 34.) To detect Br in presence of alkali, Cl or I, treat 0·1–0·2

Gm. of salt in a flask with a few drops of H_2O to dissolve, add 4–5 c.c. solution CrO_3 (15 to 25 per cent.) and suspend in neck of flask a test paper treated with Schiff's reagent for aldehydes. After a short time the paper will assume an azure-violet coloration, if Br is present, gradually turning to purple. Reaction takes place in cold, is hastened by heat, and shows Br in presence of KI, 1 : 500, and in KCl 1 : 7,000. The purple dye formed by Br and Schiff's reagent is a microcrystalline powder of metallic appearance, practically insoluble in H_2O and Et_2O, somewhat soluble in EtOH, in C_6H_6 and $CHCl_3$. Consists chiefly of Br and is doubtless identical to compound obtained by Caro and Graebe through action of Br on fuchsin.

Calcium, Determination of, as Tungstate. A. Saint Sernin. (*Comptes rend.*, 1913, **156**, 1019.) When an ammoniacal solution of calcium tungstate is boiled with excess of an aqueous solution of sodium tungstate, the calcium is entirely precipitated as $CaWo_4$ in the form of a very dense crystalline precipitate. This is collected on a tared filter, washed with hot water and dried to constant weight at 100°C. This weight $\times$ 0·1944 gives the equivalent of Ca. The precipitate being very heavy and crystalline is easily collected and washed. Mg. is not precipitated under these conditions. If present, it may be determined, if necessary, in the filtrate, in the usual manner.

Calcium Hydroxide, Stability of. P. Asher. (*J. Amer. Pharm. Soc.*, 1912, **1**, 854.) On the grounds, supported by a series of experiments, that properly prepared slaked lime, stored in a corked bottle, is reasonably stable, it is suggested that calcium hydroxide should be included in the U.S.P.

Chlorates, Sensitive Reaction for. E. Pozzi Estcott. (*Bull. Soc. Chim.*, 1913, **13**, 498.) Lafette's reaction when obtained as follows is a very sensitive indication of the presence of chlorate. One c.c. of the solution in a test-tube is treated with 2 drops of 1 : 10 aniline sulphate solution; then 3 to 4 c.c. of strong H_2SO_4 is cautiously run in so as not to mix. If 0·05 Mgm. of chlorate is present a blue ring appears at the zone of contact, which is permanent. If benzidine sulphate is substituted for aniline sulphate, an orange ring will appear with 0·005 Mgm. of chlorate. It gives the same reaction with nitrates and iodates. Aniline sulphate gives a reddish-brown ring with these.

Copper Sulphate to Remove Vegetable Growths from Drinking Water. K. F. Kellermarm. (*Internat. Cong. Applied Chem.; Amer. J. Pharm.*, **85,** 247.) $CuSO_45H_2O$ in minute quantity is the most efficient means for removing algae confervae, desmids and diatoms, which often impart a nauseous odour and taste to drinking water in stored open reservoirs. The following are the quantities of $CuSO_45H_2O$ in Mgm. per litre, requisite to remove the species named: *Anabaena* 0·09, *Asterionella* 0·10, *Beggiatoa* 5·00, *Chara* 0·20–5, *Cladophora* 1·00, *Cladothrix* 0·20, *Clathrocystis* 0·10, *Coelosphaerium* 0·30, *Conferva* 0·40–2, *Crenothrix* 0·30, *Euglena* 1·00, *Fragilaria* 0·25, *Hydrodictyon* 0·10, *Kirchneriella* 5·00–10, *Leptomitus* 0·40, *Microspora* 0·40, *Navicula* 0·07, *Oscillatoria* 0·10–0·40, *Peridinium* 2·00, *Scenedesmus* 5·00–10, *Spirogyra* 0·05–0·30, *Ulothrix* 0·20, *Uroglena* 0·50, *Volvox* 0·25, *Zygnema* 0·70.

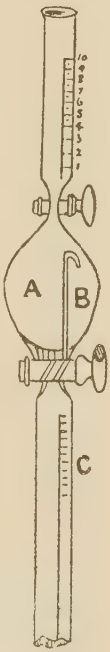
The following are the species which most frequently infect water supplies in the U.S.A., and the number of times such infection has been recorded: *Anabaena* 27, *Asterionella* 9, *Beggiatoa* 20, *Chara* 26, *Cladophora* 17, *Clathrocystis* 23, *Conferva* 56, *Crenothrix* 13, *Fragilaria* 19, *Navicula* 21, *Oscillatoria* 49, *Spirogyra* 43.

Copper, Determination of, with Hydroxylamine Hydrochloride. A. Bayer. (*Zeits. Analyt. Chem.*, 1912, **51,** 729.) Cu, in alkaline solution, is precipitated quantitatively as Cu_2O by hydroxylamine according to the equation $2NH_2OH + 4CuO = N_2O + 2C_2O + 3H_2O$. The Cu_2O may then be collected and weighed in the usual manner. The other metallic oxides in alkali such as those of Zn, Pb, As, Sb, Sn, Bi, Cd, or the double tartrates of Fe and Al, are not precipitated by NH_2OH and therefore do not, when present, affect the result.

Copper, Detection of Minute Quantities of. W. B. Pritz, A. Guillaudeu and J. R. Withrow. (*J. Amer. Chem. Soc.*, 1913, **35,** 168.) One c.c. of the liquid to be tested, in a narrow test-tube or small, thin glass, Nessler glass, is made faintly alkaline with AmOH and then faintly acid $HC_2H_3O_2$. To this 2 drops of 1 : 50 K_4FeCy_6 solution is added. In presence of Cu a pink tint is at once evident. This is more evident with minute quantities if the sides of the tube be wrapped in black paper and the light transmitted only through the bottom. By comparison with a blank tube the presence of 0·1 Mgm. of Cu in 100 c.c. can be demonstrated.

Distilled Water, Detection of Metallic Contamination in. R. Schramm. (*Pharm. Zentralh.*, 1913, **54,** 391.) Five litres of the water is filtered through a plug of absorbent cotton weighing 10 Gm. When this is partly dried, or squeezed out, it should show no darkening of colour when moistened with H_2S solution (absence of heavy metals). It should also show no blue tint when moistened with dilute HCl and K_4FeCy_6 reagent (absence of Fe). This method is more rapid and sensitive than the usual official tests.

Gasometer, New Form of. Rochereau. (*Ann. Pharm. Louvain ; Répertoire*, 192, **24,** 267.) The novel feature consists in the reservoir A fitted with a tube B which conducts the generated gas to the measuring tube C. The apparatus is useful for determining urea, H_2O_2 hypochlorides, carbonates and other compounds evolving gases.



Gold, Sensitive Colour Reactions for. J. E. Saul. (*Analyst*, 1913, **38,** 54.) Dilute solutions of reducing agents such as quinol, pyrogallol, glycin, phenyhydrazine salts, amidol, metol, vetol and metaphenylene-diamine give characteristic and varying colours with dilute Au solutions. One c.c. of a 1 : 1,000 solution of the substance with 10 c.c. of a 0·002 per cent. solution of $AuCl_3$ are convenient quantities to use. The tints vary, and are generally produced in about 2 minutes. Those obtained with metol and quinol are very fine. Paraphenylendiamine is extremely sensitive. One c.c. of a 1 : 1,000 solution is added to 10 c.c. of 0·0005 per cent. solution of $AuCl_3$. A distinct greenish-yellow colour results which is visible in a solution containing only 0·0001 per cent. of $AuCl_3$.

Hydrochlorophosphoric Acid. A. Wohlk. (*Zeits. Allgem. Oesterr. Apoth. Verein.*, 1913, 107 ; *Répertoire*, 1913 [3], **25,** 213.) The syrupy acid, met with in commerce under this name, is merely a mixture. A similar product is obtained by mixing pure phosphoric acid, 81 Gm., HCl 25 per cent., 8 Gm., water, 11 Gm.

Hypochlorites, New Method for the Estimation of. H. G. Williams. (*Chem. News*, 1913, **107,** 109.) Roncali and Roberts suggest the estimation of hypochlorites by adding (slowly) a known volume of the hypochlorite solution to a boiling solution of hydrazine sulphate in dilute H_2SO_4, and measuring the volume of nitrogen liberated, the "available chlorine" being double this.

Apparently chlorine is first set free by the acid, and acts upon the hydrazine thus :—

$$N_2H_4 + 2Cl_2 = N_2 + 4(HCl).$$

The following method is certainly simpler, and appears quite accurate enough for most purposes. The hypochlorite solution is titrated with a solution of hydrazine sulphate containing 3·2535 Gm. per litre (each c.c. = 0·0008 Gm. of oxygen = 0·003546 Gm. of chlorine), the end-point being determined by iodide-starch paper as in the well-known arsenite method of Penot. If the alkali always present with hypochlorites is not sufficient to neutralize the acid liberated, sufficient is added to ensure this; otherwise the results are irregular. $NaHCO_3$ is the most suitable for the purpose, as it has little, if any, action on the liberated iodine. The action appears to be :—

$$N_2H_4 + 2(MOCl) \doteq N_2 + 2(H_2O) + 2(MCl).$$

The results obtained compare favourably with those of Penot's method, and the solution of hydrazine sulphate is much easier to prepare than N/10 As_4O_6, and it appears to keep better.

Hypophosphorous Acid, Assay of. H. North. (*Amer. J. Pharm.*, 1913, **85,** 147.) It is proposed to neutralize HPH_2O_2 with $Ba(OH)_2$, collect on a filter any precipitate that forms and weigh after ignition. The weight in Mgm. per Gm. of absolute acid is termed the barium number. By this means, samples containing excessive amounts of foreign acids are readily detected. In the writer's opinion, an acid fit for use in medicinal preparations should have a barium number not greater than 5. Analyses of six commercial lots are given in the table.

Sample.	Acidity as Hypophosphorous Acid.	Barium Number.
No. 3548	29.73 per cent.	5·1
No. 3592	31·33 per cent.	6·9
No. 3636	31·42 per cent.	36·6
No. 3979	31·33 per cent.	12·3
No. 4400	31.20 per cent.	3·4
No. 4634	31·19 per cent.	4.4

The details of the method are as follows :—

Put 1 c.c. of HPH_2O_2 in a tared, stoppered Erlenmeyer flask and weigh accurately. Add 20 c.c. of water recently boiled to expel CO_2 and cooled, and a few drops of phenolphthalein solution. Titrate the liquid with N/5 $Ba(OH)_2$ (standardized against N/5 HCl) until a permanent pink colour is produced. Put the flask in a water-oven for an hour, then collect any precipitate that may have formed on a 7 cm. Swedish filter, washing with hot water until the filtrate no longer yields any turbidity on the addition of a few drops of dilute H_2SO_4, and burn the filter in a platinum crucible. Deduct the ash of the filter from the weight of the residue. The corrected weight in Mgm. divided by the weight in Gm. of absolute acid indicated by the titration is the barium number.

Hyposulphites, Colour Reaction for. E. Pozzi-Escot. (*Bull. Soc. Chim.*, 1913 [4], **13**, 401.) To one or two c.c. of the liquid to be tested and an equal volume of 10 per cent. ammonium molybdate solution previously mixed in a test tube, 5 c.c. of pure H_2SO_4 is carefully added, without mixing so as to form a lower layer. In the presence of a hyposulphite a blue colour is obtained at the zone of contact. If the amount exceeds 1 : 5,000 a greenish yellow ring appears before the blue colour is seen. By this reaction the presence of 0·00005 Gm. of NaS_2O_3 is easily detected.

Iodine, Simple Method for Determining. E. Winterstein and E. Herzfeld. (*Pharm. Zentralh.*, 1913, **54**, 11.) Fifty c.c. of the solution to be tested is introduced into a 250 c.c. round-bottom distillation flask with 5 c.c. of H_3PO_4, sp. gr. 1·750, and 20 c.c. of H_2O_2 solution. The flask is connected up with a condenser, and this is attached to a couple of washing flasks containing KI solution 1 : 10. A current of air is then

run through the apparatus, and the contents of the flask are carefully heated to boiling. In this way, all the I is carried over into the KI solution in 20 minutes. The liquid in the receivers is then titrated in the usual manner with N/10 hypo. I may be determined thus directly in urine. It is better, however, to render the urine alkaline, evaporate to dryness, incinerate, and then to determine the iodine, as above, in the ash.

Iodine, Determination of, in Seaweed. H. Knudsen. (*Chem. Eng.*, **17,** 119–22; *Chem. Abstr. Amer. Chem. Soc.*, **7**, 2027.) Extract 20 Gm. of seaweed ash (kelp) with several successive portions of boiling water, filter and wash till free from iodides, cool, make up to 500 c.c. and take 100 c.c. (4 Gm.) for the test. Add $KMnO_4$ solution to the boiling liquid till the pink colour persists ($KI + KMnO_4 = KIO_3 + K_2O + 2MnO_2$), add EtOH drop by drop to reduce the excess of $KMnO_4$, filter through a double filter and wash with cold water, using suction, add 10–15 c.c. of KI solution 1 : 20 and acidify with H_2SO_4 (1 : 4) ($KIO_3 + 5KI + 3H_2SO_4 = 3K_2SO_4 + 3H_2O + 61$). Titrate with N/10 hypo. Cl and Br do not interfere. The method can be employed to determining I in commercial I.

Iron, Method of Preventing Oxidation of, during Titration with $KMnO_4$. A. Leclère. (*J. Pharm. Chim.*, 1913, **7,** 587.) The following method of manipulation and using ammonium sulphate prevents the conversion of Fe reduced to the ferrous state into the ferric condition by exposure to the air. It is stated that the liquid may be filtered several times without the formation of any appreciable quantity of ferric salt. The known quantity of iron solution to be tested is reduced in the usual manner with pure Zn, a little Pt wire, and H_2SO_4 in the proportion of about 1 to 2 c.c. for each 100 c.c. of liquid, with the addition of 2 to 3 Gm. of Am_2SO_4. The mixture is then gently boiled for at least an hour under a funnel condenser. Complete reduction may be determined by spotting out on a white tile with AmCNS reagent. The liquid is then filtered through cotton, washed and titrated in the usual manner without N/10 or N/50 $KMnO_4$. This method is specially useful for determining the Fe in the ash of organic substances. In this case, the ignition residue is moistened with water and evaporated to dryness in the crucible. Five or 10 Gm. of $KHSO_4$ is then added, and the whole gently fused until the Fe_2O_3 is dissolved.

After cooling a little more $KHSO_4$ may be added. The cold melt is then dissolved in water and treated as above.

Iron, Reduced Determination of Fe in. O. E. Winters. (*J. Amer. Pharm. Assoc.*, 1913, **2**, 296.) The processes official in all the pharmacopœias are tried and compared. Krauch and Merck's test is considered to be more convenient and accurate than any of these. This is carried out as follows :—

One Gm. iron is brought into a 100 c.c. measuring flask, 10 Gm. of finely powdered $HgCl_2$ and 50 c.c. of boiling water are added and the mixture kept boiling on wire gauze over a small flame for five minutes, shaking frequently. The flask is then filled up to mark at once with cold water. After cooling to 15°C. the flask is filled up again to mark, shaken well and left standing well stoppered for settling. The solution is filtered and 10 c.c. of the filtrate is titrated with N/10 $KMnO_4$ under addition of 10 c.c. of diluted H_2SO_4. At least 16 c.c. of the N/10 should be used up. In order to control this test, dissolve in the titrated solution 2 Gm. of KI, leave stand stoppered for one hour at a temperature of 20°C., and then titrate with N/10 hypo., using starch indicator. One c.c. of N/10 $KMnO_4$ or N/10 hypo. is equal to 0·00559 Gm. Fe.

Kambara Earth : A Decolourizing Material for Oils. K. Kobayashi. (*J. Ind. Eng. Chem.*, 1912, **4**, 892.) This Japanese siliceous earth is an extremely efficient decolourizing and filtering agent for mineral, animal and vegetable oils. It differs from the other siliceous earths examined in having a slight acid reaction, and containing the silica in a more highly hydrated condition. To distinguish it from kaolin and talc it is proposed to call it "acid earth."

Manganese, Distribution of, in Plants. F. Jadin and A. Astruc. (*J. Pharm. Chim.*, 1913, **7**, 155.) Mn is found to be universally present in plant tissues. A table is given showing the amount of Mn, calculated on the moist and dry material and on the ash of the same, from 85 species of plants. In this, the most Mn, calculated on the fresh tissue, was found in *Quercus palustris* and in *Viscum album* growing on *Populus nigra*, both containing 20 Mgm. of Mn in 100 Gm. The figure is, however, very variable in the case of *Viscum album*. That grown on apple contained only 2·5 Mgm. and on *Sorbus aucuparia* 1·6 Mgm., on *Crataegus*, 1·0 Mgm. The mistletoe growing on the actual

oak *Quercus palustris* mentioned above gave 16 Mgm. But the actual *Populus nigra* on which the mistletoe giving 20 Mgm. grew showed only 16 Mgm. In the dry material, the most Mn was found in *Pedicularis sylvatica*, which gave 76 Mgm. from 100 Gm. The ash from one lot of sawdust of *Abies pectinata* contained more Mn than the ash of any vegetable, 909·09 Mgm. in 100 Gm.; another lot of sawdust from the same species only gave 221·23 Mgm. There appears to be considerable variation in the amount of Mn present in members of the same family and in individuals of the same species. And also there appears to be no connexion between the amount of Mn in the parasite and in the host. The chlorophyll-containing organs yield more Mn than the terrestial or subterranean parts. There is no doubt that the vegetable tissues are the main source of the Mn found in animal organs.

Manganese, Microchemical Reaction for. M. Wagenaar. (*Pharm. Week Blad.*, 1912, 14; *Pharm. Zentralh.*, 1913, **54,** 84.) Manganese salts form with $K_2Cr_2O_7$, characteristic doubly refractive crystals, probably of a double salt, since it is not formed with Am_2CrO_4 or with Na_2CrO_4. As little as 0·0000002 Gm. is said to be thus detectable. The test should be made in neutral or very faintly acid liquids. It has the advantage over the well known oxalate reaction, that the presence of Zn does not so greatly interfere. In the presence of much Zn, however, the Mn may be precipitated by means of H_2O_2 and AmOH as MnO_2 and the test applied to the precipitate. In this way the presence of 0·1 per cent. of Mn in Zn can be detected.

Manganese, Universal Distribution of, in Animal Organs. G. Bertrand and F. Medigreceanu. (*Comptes rend.*, 1912, **154,** 553.) Mn has been found in all the animal organs examined except the albumin of birds' eggs. Yet the organs of birds contain more Mn than those of mammals. Milk contains but little, but it is richer in Mn than the blood of the same animal. Mn is so generally present and in such quantity, that it cannot be regarded as of no physiological importance.

Mercury, Detection and Determination of, in Felt and other Textile Materials. L. L. Lloyd and W. M. Gardner. (*J.S.C.I.*, 1912, **31,** 1109.) The occurrence of indications of mercurial poisoning among operatives employed in felt hat making was traced to the use of solution of $Hg2NO_3$ in the process of "carrot-

ing" rabbit and other fur. The object of this is to raise the outer scales of the hair and thus increase its felting properties. Considerable quantities of Hg may be isolated from hatters' fur, and hat body, and an estimable amount remained in a felt hat which had been worn for 12 months.

Detection of Hg.—About 5 Gm. of the material is cut into small pieces and warmed on the water-bath with a small quantity of aqua regia diluted with three times its volume of water, in a $1\frac{1}{2}$ litre flask fitted up for distillation in superheated steam. The acid solution in the flask is now slowly treated with a slight excess of Zn dust, and then distilled in superheated steam at 160 to 170°C., the flask being provided with a splash-trap. A coil of clean Cu wire gauze is placed in the broad part of the inner tube of the condenser and another piece is placed in an adaptor at the lower end of the condenser. The Hg is volatilized by the superheated steam and amalgamates with the Cu, the major portion being collected at the first Cu gauze coil. The coils are washed with a little EtOH, dried in the air, and then heated in a dry tube closed at one end, the other end being drawn out fairly thin in order to obtain rapid cooling. The Hg is volatilized by gently heating, and condensed on constricted portion of the tube. After cooling, a very small crystal of I is introduced into the tube, which is gently heated to volatize it through the tube; the vapour on coming into contact with the Hg gives an orange to red colour. As gives a yellow colour and Sb a brown to yellow colour. The portion of the tube containing the iodide is cut out and heated in a test tube containing one drop of nitric acid. The iodides of As and Sb are quickly decomposed, whereas HgI_2 is only slowly acted upon.

Estimation of Hg.—The weighed material, the amount depending upon the indication obtained from the above qualitative test, is heated to about 50°C. with diluted aqua regia (1 aqua regia to 2 water) and the extract poured off, the extraction being repeated about six times; the residue is finally well washed with hot water. If the material contains animal fibres, the flask, during the extraction with acid, should be briskly shaken to prevent loss from too violent action. To avoid this it is advisable to fit the flask with a short air condenser. On no account should concentrated aqua regia be employed because $HgCl_2$ is fairly volatile in HCl gas. The combined extracts and washings are made slightly alkaline with NaOH, the solution saturated with H_2S, allowed to stand in a warm place for a short

time and then just acidified with acetic acid. After standing for some time the precipitate is filtered off and well washed until Cl is completely removed. The precipitate is treated on a specially constructed glass percolator filter (which is figured, first through a layer of fine quartz, silica, or kaolin, then through a layer of glass wool, supported on a layer of rough quartz) with warm dilute HNO_3, and finally with boiling dilute HNO_3 (one acid to 3 water). The Hg remains upon the filter as HgS; it is dissolved from it by warm somewhat dilute aqua regia and the solution compared colorimetrically with standard Hg solution.

The solution is made as nearly neutral as possible with NaOH, or with very small amounts of Hg the solution may be made alkaline. To this solution is added 5 c.c. of the reagent and the colour compared with standard solutions of Hg, treated under exactly the same conditions, in Nessler glasses.

The standard solution of Hg is made from H_6Cl_2, or better from Hg dissolved in dilute aqua regia, and to contain 0·1 Gm. Hg in 1,000 c.c. The reagent contains per 100 c.c. 0·2 Gm. of KI, 6·0 Gm. of NaOH, and 2·0 Gm. of AmCl. The estimation must be carried out under exactly similar conditions as in the estimation of ammonia by the Nessler method; the standard mercury solution and the specimen under examination being treated with the same volume of reagent and the colour compared after the same lapse of time after mixing.

In the estimation of Hg in the hatter's material, 10 Gm. of fur were used in each case and the final solution made up to 100 c.c., 50 c.c. being compared in Nessler glasses with the standard Hg solution. (See also *Y.B.*, **1905**, 111, 112; **1911**, 149.)

Mercury, Determination of, as Metal by the Dry Method. A. C. Cumming and J. Macleod. (*J. Chem. Soc.* 1913, **103**, 513.) It is found that the process of determining Hg by the dry method is simplified, if the mercury compound is heated in a small Penfield tube with a mixture of CaO, iron filings, and $PbCrO_4$.

Mercury Oxycyanate, Testing Commercial Samples of. E. Schmidt. (*Apoth. Zeit.*, 1912, **28**, 431.) The purity of commercial oxycyanate of mercury leaves much to be desired. Its quality is easily determined by the following test of E. Rupp. About 0·5 Gm. of the finely-powdered substance is treated with 0·5 to 0·6 Gm. of pure NaCl and 10 to 20 c.c. of water with agitation without warming; when practically all is dissolved another

30 to 40 c.c. of water is added and the solution is titrated, after adding 2 drops of alcoholic dimethylamido-azo-benol indicator, with N/10 HCl until a pale pink colour appears. 0·5 Gm. of normal $Hg(CN_2)HgO$ will require 21·4 to 21·6 c.c. of N/10 HCl 1 c.c. = 0·0234 Gm. That weight of a specimen prepared by the author required 21·5 c.c. Two trade samples gave practically the same figure. But two other samples required only 8·3 c.c. and 5·5 c.c. of N/10 HCl, equivalent to 38·8 and 25·7 per cent. of true oxycyanate. The impurity which is relatively insoluble is $Hg(CN)_2$. The above test need occupy only a few minutes.

Nickel, Detection of, in Metallic Articles. V. Fortini. (*Chem. Zeit.*, 1912, **36,** 1461.) The following reagent affords a convenient means of detecting Ni in metallic articles and alloys. It has the advantage that the stain produced is easily rubbed off with a cloth so that the appearance of the object is not damaged by the test. Also the reagent keeps well in a stoppered bottle. Dimethylglyoxime, 0·5 Gm., is dissolved in EtOH 98 per cent., 5 c.c.; then strong AmOH 5 c.c. is added. A clear, yellowish liquid results. If a drop of this be applied, by means of a glass rod, to the metallic surface, previously cleaned from grease with a little ether, pink spots will appear after a time if Ni be present. In the case of new articles, or of alloys, a more sensitive reaction is obtained by first exposing the spot to be tested to the oxidizing flame of the blowpipe.

Nitrates, New Reaction for. W. N. Iwanow. (*Chem. Zeit.*, 1913 [16]; *Pharm. Zeit.*, 1913, **58,** 209.) Iridium, 0·025 Gm., in the form of Ir_2O_2 or $(NH_4)_2Ir_2Cl_6$ is treated with 4 to 5 c.c. of water and 100 c.c. of strong sulphuric acid. The mixture is then strongly heated until colourless. The substance to be tested must be in a dry condition, all moisture having previously been driven off by heating. It is then added in a solid form to 5 c.c. of the above reagent and heated. In presence of HNO_3 a blue colour appears. The reaction is best obtained in an atmosphere of CO_2.

Potassium, Determination of, as Chloroplatinate in Presence of Sodium. G. Mellière. (*J. Pharm. Chim.*, 1913, **7,** 281). Instead of alcohol, as generally employed, acetone should be used as the solvent to prevent the precipitation of the double sodium-potassium platinochloride. It is much more efficacious.

Potassium Hydroxide, Alcoholic Standard Solution. R. Gaze. (*Apoth. Zeit.*, 1913, **28,** 174.) KOH, purified by alcohol, 66 Gm., is dissolved in water 66 Gm., in a litre flask. When cold, the solution is made up to 1,000 c.c. with absolute EtOH, set aside for 24 hours and filtered. It may then be standardized, and kept protected from the light.

Sodium Perborate, Valuation of. (*Evans' Analyt. Notes*, 1912, **7,** 72.) A sample in a granular condition, estimated by Bosshard and Zwicky's method, decomposing 0·3 Gm., in a nitrometer, using 1·2 Gm. pure MnO_2 and 20 c.c. 15 per cent. H_2SO_4 gave 9·2 per cent. of available O. (Only half of O evolved is derived from the perborate.)

The pure salt $NaBO_3.4H_2O$ yields 10·46 per cent. oxygen; the rather low strength of 87·7 per cent. observed was due to the fine state of division, large crystals being more stable. The residue on ignition was found to be 48·1 per cent., indicating the absence of tetraborate, the diluent being simply metaborate.

Sodium Perborate, Commercial. — Ebren. (*J. Pharm. Chim.*, 1913, **7,** 245.) Sodium perborate, $NaBO_3.4H_2O$, is easily prepared in a pure state. Borax, 20 Gm., is treated with the theoretical amount of N/NaOH solution to convert it into $NaBO_2$, and then with 300 c.c. of H_2O_2 solution. After 24 hours the crystalline precipitate is collected and dried on bibulous paper. It then has the above composition and is quite permanent. Commercial samples were found to differ very widely from this. The pure sample gave 10·40 per cent. of available oxygen; the amount in the samples varied 1·7 to 9·6 per cent., excluding an obviously decomposed sample containing only 0·88 per cent. Now that the perborate is coming into use as a surgical antiseptic it is necessary to closely examine the article supplied. Tables are given showing the results of the determination of oxygen, residue, Na_2O and B_2O_3. The figures show a wide range of differences.

Sulphocyanic Acid. U. Ruck and H. Steinmetz. (*Apoth. Zeit.*, 1912, **27,** 642.) When KCNS is triturated with $KHSO_4$, HCNS is evolved as a pungent, colourless gas, much less poisonous than gaseous HCN. When cooled to between —30° and —40°C. this solidifies to a white, very soluble crystalline mass.

Sulphurated Potash, Decomposition of, on Keeping. H.

Pecker. (*J. Pharm. Chim.*, 1913, **7**, 340.) The fact that liver of sulphur is very unstable is well known. The author has investigated the rate of change and the nature of the decomposition products. A sample seven years old was found to be devoid of potassium sulphides and to contain S, 24 per cent.; $K_2S_2O_3$, 54 per cent.; K_2SO_4, 20·5 per cent.; K_2CO_3, 0·57 per cent. A freshly prepared sample gave: S, traces; polysuphides (as K_2S), 35·32 per cent.; $K_2S_2O_3$, 22·92 per cent.; K_2SO_4, 27·26 per cent. The appearance of the cakes is sufficient indication of change. The fracture of a good specimen is liver-coloured throughout. It should be entirely soluble in distilled water. (See also *Y.B.*, **1912,** 475, and *Gen. Index.*)

Syphon Heads, Aluminium, Action of Carbonated water on. A. Barillé. (*J. Pharm. Chim.*, 1911, **6,** 110.) Resuming his investigations (*Y.B.*, **1912,** 369) on the action of water charged with CO_2 under pressure, the author finds that Al fittings are not suitable for use, if the surface of the metal comes in contact with the liquid. Under these conditions a quantity of alumina is quickly formed, which, although free from toxic effects, imparts a very unsightly appearance to the beverage. It is therefore recommended that all aluminium fittings should be lined with porcelain or some other protective layer on all those parts which at any time touch the liquid.

Tin, Electrolytic Method for the Determination of, in Canned Food Products. A. S. Cushman and E. B. Wetherell. (*J. Ind. Eng. Chem.*, 1913, **5,** 217.) The regulations of the U.S. Department of Agriculture with reference to the amount of Sn permissible in tinned foods limit this to 300 Mgm. per kilo. In consequence, a large number of Sn determinations have been requisite to control the amount of metallic contamination in these articles. The ordinary gravimetric methods are tedious, and inconvenient. The following electrolytic method is an improvement on these, giving more accurate results in a shorter time.

Fifty Gm. of the pulped material is placed in a 600 c.c. beaker and brought to a slow boil with 50 c.c. of HCl and 25 c.c. of HNO_3. The mixture is stirred continuously and the boiling continued for eight minutes unless there is danger of foaming, in which case the flame is removed and the material allowed to digest for ten minutes. The solution is then diluted with about an equal quantity of water, made alkaline with strong AmOH and 25 c.c. of saturated AmHS. The mixture is digested for

a few minutes with thorough stirring, and all insoluble organic matter filtered out on a ribbed filter. The washing is done with boiling water containing a little AmHS, making the total filtrate up to 400 c.c. The solution is then electrolysed hot, using 1·5 ampères at 6 volts. A rotating cathode is used. The end of the revolving spindle carries a rubber stopper over which a clean weighed platinum crucible is slipped. An apparatus is figured for carrying out the electrolysis of a number of determinations at the same time. From one to four hours is necessary to complete an electrolytic run, two hours being generally sufficient, except in cases in which the tin content is very high. At the end of the experiment the crucibles are cleaned by heating in a solution made by mixing 100 c.c. of 10 per cent. oxalic acid with 100 c.c. of concentrated nitric acid.

Tin, Sensitive Reaction for. C. Zenghelis. (*Zeits. Phys. Chem. Untersuch.*, 193, **24,** 137 ; *Pharm. Zentralh.*, 1913, **54,** 510.) A reagent is prepared by dissolving 1 Gm. of MoO_3 in dilute NaOH, adding a slight excess of HCl and water to make 200 c.c. On adding to this 1 drop of Sn in solution in HCl a deep blue colour is produced in presence of as little as 0·000001 Gm. of Sn.

Zinc and Mercury Cyanide. D. B. Dott. (*Pharm. J.*, 1913 [4], **36,** 98.) After having alluded to the original publications of Dunstan (*Y.B.*, **1890,** 28 ; **1892,** 27) and his own work on the subject (*Y.B.*, **1905,** 486), the author describes fresh experiments which show that if prepared strictly according to Lister's process the so-called double cyanide of zinc and mercury does not contain the amount of Hg required by Dunstan's formula. This confirms the previous experience of the author. It is maintained that Lister's formula gives a product yielding between 25 and 28 per cent. of Hg and not 35 per cent. as stated by Dunstan. The higher percentage can be obtained only by modifying the process. Reduction by means of HPH_2O_2, in HCl solution, is a satisfactory method of determining the Hg in this preparation.

Zinc Salts, Official Electrolytic Determination of. J. Rosin. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 932.) The decomposition of zinc salts by means of electrolysis forms a convenient and extremely accurate method for the valuation of the official salts. A determination can easily be made in the course of less than

one hour, the analyst's time consumed amounting only to fifteen to twenty minutes.

Several electrolytes can be used, all yielding equally good results. Sodium hydroxide is the simplest and is well adapted for the determination of all the pharmacopœial zinc salts. A weighed quantity of the salt corresponding to 0·1–0·2 Gm. of metal contained in the previously weighed nickel electrolysing dish is dissolved in a little water or dilute H_2SO_4 or HCl, 75 c.c. of 10 per cent. NaOH solution added, diluted with water to about 120–130 c.c., the solution heated almost to boiling and electrolysed for twenty to thirty minutes with a current of 4–5 ampères and 5–6 volts, the anode making about 600 revolutions per minute. Without interrupting the current, the deposit is then washed with distilled water with the aid of a siphon, until the current drops to nearly zero, then remove the dish and wash the deposited zinc with a little EtOH and Et_2O, dry in the desiccator for a few minutes and weigh.

For the analysis of zinc metal about 1·5 Gm. is dissolved in dilute HCl, filtered if necessary, diluted with water to 100 c.c. and 10 c.c. taken for the determination. Zinc stearate dissolves but very slowly in NaOH. To determine the zinc in it, it is best to boil about 1 Gm. with 10 c.c. of dilute H_2SO_4 and 25 c.c. of water, filter while hot into the electrolysing dish, wash with hot water until the volume of the filtrate amounts to about 120 c.c. then add 8 Gm. NaOH and electrolyse. If a Pt dish be used for Zn electrolysis, it should be first coated with Ag. Ni dishes answer excellently.

Zinc Valerianate. (*Evans' Analyt. Notes*, 1912, **7.**) Valuation of this salt based on the amount of ZnO resulting from direct ignition is of little use. The possible extent of error through loss by volatilization is illustrated by the extreme cases shown; very rapid ignition, uncovered crucible = 12·0 per cent. ZnO; more cautious ignition, covered crucible = 16·0 per cent. ZnO; very cautious ignition with excess of HNO_3 = 29·6 per cent. ZnO; very cautious ignition with excess of $(NH_4)_2S$ = 30·4 per cent. ZnO; volumetrically = 30·6 per cent. ZnO.

The volumetric figure quoted is obtained by titrating 1 Gm. of zinc valerianate acidified with H_2SO_4 against standard (6·4 per cent.) $K_4Fe(CN)_6$ which has been previously set against an exact amount of zinc in solution: spotting out with uranyl nitrate, the end point is reasonably sharp if there is no delay in withdrawing to the tile.

ORGANIC CHEMISTRY: UNCLASSIFIED

Acetone, Purification of, by means of NaI. Kathleen Shipsey and E. A. Werner. (*Proc. Chem. Soc.*, 1913, **29,** 194.) It was recently shown that NaI can unite with acetone to form a crystalline compound having the composition $NaI,3C_3H_6O$. Experiments show that acetone in a high degree of purity can be prepared from the commercial article in this manner. The hydrated salt $NaI,2H_2O$ may be used with advantage on account of its ready solubility in acetone; the solution when cooled to about $-8°$ gives a very good yield of the above compound, and it is possible to obtain 70 per cent. of the acetone in a pure state in a single operation. The purified acetone was found to be quite equal to that prepared by the tedious $NaHSO_3$ process.

Ammonium Salts of Organic Acids, Preparation of. E. H. Keisein and L. McMaster. (*Chem. News*, 1913, **107.**) The method suggested on the fact that most organic acids are soluble in Et_2O or EtOH, or a mixture of the two, while the ammonium salts are insoluble, and can be thrown down by a stream of dry NH_3 gas. Crystalline with amorphous precipitates are thrown down at once; and then are washed with Et_2O and dried. In some cases a gelatinous precipitate is first formed, but this soon changes into a crystalline powder. Ammonium malate, fumarate, mesaconate and citraconate have been thus prepared.

Amyl Alcohol, New Reaction for. De Wyss, E. Herzfeld and — Rewidzow. (*Pharm. Zentralh.*, 1912, **53,** 130.) To 2 c.c. of the solution to be tested are added 4 drops of a freshly prepared solution of α-naphthol, 4·5 Gm., in alcohol 50 per cent., 100 c.c.; 4 drops of a solution of paraphenylenediamine, 4·5 Gm in absolute alcohol, 100 c.c.; and 4 drops of aqueous solution of anhydrous Na_2CO_3, 4·5 Gm., in 100 c.c. In presence of amyl alcohol an intense violet colour results. Isobutyl alcohol gives a much feebler reaction. Heptyl, octyl, cetyl alcohols, glycerol and wax give fainter reactions. Methyl and propyl alcohols, and their esters, benzol, toluol, xylol, sugar, inositol, fatty acids and uric acid, give no reaction.

Artemisin and Santonin, New Derivatives of. E. Rimini and T. Jona. (*Rend. Soc. Chim. Ital.*, 1913, **5,** 52; *Chem. Zentralb.*, 1913, **1,** 1773.) Two new hydrated derivatives have

been obtained by Paal's method from artemisin and santonin. On passing H for 48 hours through a solution of artemisin in aqueous alcohol, in presence of colloidal Pd, *tetra-hydro-artemisin*, $C_{15}H_{22}O_4$ is obtained, crystalling from C_6H_6 in shining leaflets, m.p. 192-193°C, not acted on by $KMnO_4$. *Tetra hydrosantonin*, $C_{15}H_{22}O_3$, in white crystals, m.p. 153–155°C., is obtained from santonin in a similar manner.

Benzoic Acid, Quantitative Separation of, from Cinnamic Acid. J. Bougault and Mouchel-la-Fosse. (*J. Pharm. Chim.*, 1913, **7**, 473.) After investigating the known, but little used reaction of alkali sulphites, neutral and acid, with ethylenic acids, the authors avail themselves of it to separate small quantities of benzoic acid from admixture with a large amount of cinnamic acid. A mixture of cinnamic acid, 1 Gm., with benzoic acid, 0·020 Gm., was treated with water, 15 c.c., Na_2SO_3, 1·5 Gm., and solution of $NaHSO_3$ (30 : 100), 2 c.c. The mixture was heated for five hours in the boiling water-bath. On then acidifying the contents of the tube with HCl and shaking out with Et_2O the benzoic acid was recovered pure, and weighed 0·0195 Gm. The method is applicable for separating many other similar acids. A number of experiments are detailed, showing the conditions under which certain ethelenic acids may be sulphonated by alki-sulphites to form soluble sulphonates, even when the original acids are insoluble.

Calcium Glycerophosphate. (*Evans' Analyt. Notes*, 1912, **17**, 17.) A sample examined was found to give: Calcium, 16·8 per cent. (gravimetrically, after precipitation as oxalate from a hot acetic acid solution); loss (water) at 115°, 9·1 per cent. (three hours); loss (water) at 130°, 9·8 per cent.; loss (water) about 180°, 13·7 per cent. Decomposition occurring at upwards of 180°. Residue after ignition, 49·2 per cent.

This sample practically conformed to the German formula, $CaPO_4C_3H_5(OH)_2 2H_2O$, rather than the anhydrous composition put forward in the B.P. Codex.

Merck (*Ann. Report*, 1911, 5) has more recently published a rapid direct volumetric method for estimation of this salt. Titrating 1 Gm. dissolved in water with N/1 HCl, using methyl orange, 1 c.c. N/1 acid = 0·2461 Gm. of hydrated glycerophosphate, and using such estimation with a back phenolphthalein reading, the latter has been found to consistently indicate 3·75 per cent. higher than the former.

Bismuth, Organic Salts of, with Alkalis. R. C. Cowley. (*Proc. Australas Pharm. Conf.; Austral. Journ. Pharm.*, 1913, **28,** 19.) Bismuth citrate acts as a monobasic acid, giving a well-defined end reaction when titrated with solution of ammonia or some other alkali, using litmus paper as an indicator.

Alkali Bismutho-Citrates. — Bismutho-citrates of sodium, potassium, or lithium are easily prepared by neutralizing freshly-precipitated bismuth citrate with the hydroxides, carbonates, or bicarbonates of these alkalies. The solutions on evaporation yield compounds which are soluble in water. The sodium compound dissolves more readily in water containing a little glycerin. These alkali bismuth compounds are capable of practical use. Bismutho-citrate of lithium is already on the market, and is recommended as a remedy for rheumatic gout.

The sodium compound has a great future before it. A solution containing the same quantity of bismuth as the liquor bismuthi, approximately equivalent to 77 Gm. of bismutho-citrate of sodium per litre, prepared last year, is still in a perfect condition. The solution of sodium carbonate is added to the bismuth citrate and heated to expel the carbon dioxide. An excess of the alkaline carbonate would, of course, precipitate the bismuth from solution. This compound is preferable to the bismutho-citrate of ammonia for use in medicine.

Alkali Bismutho-tartrates. — Ammonium bismuth-tartrate has been recommended from time to time as a basis for bismuth and pepsin mixtures, but it presents no special advantages.

The solution containing an equivalent amount of bismuth to the liquor bismuthi A.P.F. may be made according to the following formula :—

Bismuth subnitrate, 70 Gm.; nitric acid (sp. gr., 1·420), 57 c.c.; sodium potassium tartrate, 96·6 Gm.; sodium bicarbonate, 37·25 Gm.; solution of ammonia water, a sufficient quantity.

Other alkali bismutho-tartrates are easily prepared by substituting alkali hydroxides or carbonates for the solution of AmOH in the above formula. None of these compounds appear to possess any particular advantage over the bismutho-citrates, and are never likely to take their place in medicine.

Alkali Bismutho-racemates.—Racemic acid readily forms alkali bismutho-racemates.

Other Organic Bismuth Compounds.—Bismuth malate, succinate, phthalate, camphorate, are all easily prepared, but in

no case do they form soluble compounds with alkalies. The behaviour of the malate towards alkalies is interesting, as its relationship to tartaric acid would lead one to anticipate the formation of soluble compounds similar to the tartrates.

Bismuth Subgallate Adulterated with Sulphur. H. Manseau. (*Bull. Soc. Pharm. de Bordeaux; Répertoire*, 1912, **24**, 347.) Notwithstanding its good appearance, a sample of commercial bismuth subgallate aroused suspicion from its density. When ashed with HNO_3 it gave only 47·2 per cent. of Bi_2O_3 instead of 56 per cent. When ashed directly, it burned with a blue flame and evolved SO_2. It was adulterated with S.

Casein instead of Hide Powder for Tannin Determinations. M. Nierenstein. (*Pharm. Zentralh.*, 1912, **53**, 1249.) Casein in powder, deprived of fat by extraction with Et_2O is preferable to hide powder for fixing tannin. One hundred c.c. of the tannin solution is shaken first for ten minutes with 6 Gm. of the dry, pure casein, then a second time with 3 Gm. The determination is then continued in the usual manner.

Chloral Hydrate, Combination of, with Urotropine and with Caffeine. A. Leulier. (*J. Pharm. Chim.*, 1913, **6**, 18.) Chloral hydrate forms two definite chemical compounds with urotropine, monochloral urotropine $[(C_2HCl_3O,H_2O)(CH_2)_6N_4]$ and dichloral urotropine $[(C_2HCl_3O,H_2O)_2(CH_2)_6N_4]$. The former crystallizes first in needles which are slowly transformed in rhomboids, and the latter permanently in needles. The monochloral compound is obtained by dissolving equimolecular weights of the two constituents in the smallest possible quantities of water, and mixing the solutions when a crystalline precipitate is formed. The dichloral compound is similarly prepared, using twice the quantity of chloral hydrate. Both volatilize before melting.

With caffeine, chloral hydrate forms two analogous compounds $[(C_2HCl_3,H_2O)(C_8H_{10}N_4O_2,H_2O)]$ and $[(C_2HCl_3,H_2O)_2(C_8H_{10}N_4O_2,H_2O)]$. A 1 : 5 aqueous solution of chloral hydrate is quickly saturated with caffeine and filtered. On standing in a closed vessel a crystalline deposit is formed. This is dichoral caffeine, melting at 72–73°C. when dried over H_2SO_4. On keeping the m.p. of this substance gradually rises until it remains constant at 92–93°C. This is monochloral caffeine, formed by the loss of C_2HCl_3O,H_2O from dichlorocaffeine.

Chloroform, Anæsthetic, and Pure, Tests for. C. Baskerville and W. A. Hamor. (*J. Ind. Eng. Chem.*, 1912, **4**, 499, 570.) In concluding the exhaustive treatise on chloroform previously abstracted (*Y.B.*, **1912**, 168) the authors reiterate the tests there given with the following additions. *Water.*—Pure chloroform and anhydrous anæsthetic chloroform should comply with the following test: When 20 c.c. of the sample is boiled over 1 Gm. of clean crystals of calcium carbide, and the vapours evolved are passed into ammoniacal $AgNO_3$ solution, no acetylene reaction should result. Anæsthetic chloroform should readily conform to this test: When 10 c.c. of the sample is agitated with an equal volume of paraffin oil (sp. gr. 0·880), the oil should dissolve to a clear solution without any evidence of a turbidity. *Alcohol.*—Pure chloroform should possess a correct sp. gr. and should comply with the following: 10 c.c. is shaken in a separator with 4 c.c. of concentrated H_2SO_4; the extraction is again repeated with 4 c.c. of H_2SO_4, and finally with 2 c.c. The H_2SO_4 solution is now mixed with 40 c.c. of water, and the diluted solution is gently distilled until the distillate amounts to about 20 c.c. To 10 c.c. of the distillate, 6 drops of a 10 per cent. solution of KOH is added and the liquid warmed to about 50°C. A solution of KI fully saturated with free I is next added, drop by drop, with agitation, until the liquid becomes permanently yellowish brown in colour, when it is carefully decolourized with potassium hydroxide solution. No CHI_3 should be deposited at the bottom of the tube. This test is not peculiar to alcohol, being produced also by acetaldehyde, propyl alcohol, acetone, etc.; but pure chloroform should give an absolute non-response. In the case of anæsthetic chloroform and commercial chloroform, an indication as to the amount of alcohol present may be had from the sp. gr. of the sample; but no definite conclusions should be arrived at until a quantitative estimation of the alcohol has been made by the method of Nicloux, or as modified by Behal and François. *Acetone.*—Pure chloroform complying with the iodoform test is assuredly free from acetone. Anæsthetic chloroform should give a negative reaction in all cases when the following exclusion test is applied: 10 c.c. of the sample is agitated with 5 drops of a 0·5 per cent. sodium nitroprusside solution and 2 c.c. of AmOH (sp. gr. 0·925) and the mixture is then allowed to stand for several minutes. $CHCl_3$ containing up to 1 per cent. of EtOH may impart a yellowish brown colour to the supernatant liquid on agitation, but

when acetone is present an amethystine colour results. This test must be conducted in the cold. After application to the suspected $CHCl_3$ direct, the first 10 per cent. distillate and the 10 per cent. residuum, obtained by allowing 100 c.c. of the sample to slowly distil, should be tested. When the proportion of acetone to $CHCl_3$ is 1 : 500, the amethyst colour is marked ; but in the presence of 1 part in 1,000, the coloration is not distinct until the mixture of chloroform with AmOH and sodium nitroprusside has been saturated with Am_2SO_4, shaken and then allowed to rest for five minutes. It is advisable, in all cases, to run a blank test on pure anæsthetic $CHCl_3$ for comparison. Since acetaldehyde is generally present in fresh and properly stored samples of anæsthetic chloroform in proportions greater than 1 : 3,300, usually the reaction is not interfered with by this substance, but in every case the sample should be examined for the presence of acetaldehyde, and if it complies with the following test a positive reaction upon applying the acetone test may be said to be solely indicative of the presence of acetone. *Acetaldehyde.* (*a*) Chloroform of all grades should pass this exclusion test : 5 c.c. of the sample is agitated with 5 c.c. of the reagent of François in a glass-stoppered tube ; no coloration should result even after fifteen minutes. The presence of three parts of acetaldehyde by volume in 10,000 of chloroform may thus be made evident and smaller amounts may, of course, be detected by resorting to fractionation. (*b*) Pure chloroform giving a negative reaction to the EtOH test may be regarded as free from acetaldehyde ; but it should, in addition, give no response when 5 c.c. is agitated with 5 c.c. of Nessler's reagent, and the mixture is allowed to stand five minutes. When 10 c.c. of anæsthetic chloroform is agitated with 10 c.c. of water and 5 drops of Nessler's reagent, U.S.P., and the mixture is then allowed to stand for five minutes, there should result no precipitate, and the reagent should assume no coloration, although it may become opalescent or slightly turbid. *Acidity.*—When 20 c.c. of either pure or anæsthetic chloroform is thoroughly agitated with 10 c.c. of water and 2 drops of phenolphthalein solution and then titrated with N/100 KOH solution, added drop by drop, not more than 0·2 c.c. should be required to produce a faint but decided alkaline reaction permanent for fifteen minutes, when the mixture is shaken thirty seconds after the addition of each drop of alkali. If the presence of free acid is indicated, the sample should be rejected. *Decomposition Pro-*

ducts.—(*a*) Carbonyl chloride. To 15 c.c. of the sample, contained in a dry glass-stoppered tube of 25 c.c. capacity, sufficient of a perfectly clear 1 : 19 $Ba(OH)_2$ solution is added to fill the tube ; after allowing the mixture to stand three hours in a dark place without agitation, the observation as to the formation of a film of $BaCO_3$ is made. (*b*) Hydrochloric acid and chlorides. Samples of $CHCl_3$ complying with the test for acidity are assuredly free from carbonyl chloride, HCl and Cl ; but pure and anæsthetic $CHCl_3$ should also conform to the following test : When 10 c.c. of the sample is agitated with 5 c.c. of water for five minutes, the water extract should not become turbid or give any precipitate upon the addition of $AgNO_3$ (absence of HCl), and no reduction should occur on warming (absence of acetaldehyde, formic acid and formates, etc.). (*c*) Chlorine (and hydrogen dioxide). When 10 c.c. of the sample is agitated during fifteen minutes with 10 c.c. of a 10 per cent. cadmium potassium iodide solution, there should result no liberation of iodine as determined by the addition of starch solution. Chloroform of all grades should give a negative reaction with this test. Anæsthetic chloroform failing to comply with the acidity test, and which contains none of the substances referred to above (this will generally be found to be the case), should be rejected, since then the indication is that acetic acid is present. When 20 c.c. of anæsthetic chloroform is shaken during twenty minutes with 15 c.c. of concentrated H_2SO_4 in a glass-stoppered tube of 50 c.c. capacity previously rinsed with sulphuric acid, and 2 c.c. are diluted with 5 c.c. of water, the liquid should remain colourless and clear, and should possess no odour foreign to anæsthetic chloroform (chloroform and alcohol) ; and the liquid should retain its transparency and colourless state when further diluted with 10 c.c. of water, and the transparency should not be diminished on the addition of 5 drops of $HgNO_3$ solution. A positive result is indicative of the presence of chlorinated derivatives of the oxidation products of alcohol, etc.

Chloroform, Rapid Method for Determining, in Liniment of Chloroform U.S.P. J. L. Mayr. (*Amer. J. Pharm.*, 1912, **84**, 372.) A carefully measured volume of the liniment, mixed with an equal volume of water, is cautiously distilled into a graduated cylinder containing water. When $CHCl_3$ ceases to distil, the cylinder is filled with H_2SO_4, 1 : 10, and allowed to stand for the $CHCl_3$ to subside. The volume may then be read off. (Lini-

mentum chloroformi U.S.P. is composed of chloroform 3 ; soap liniment to make 10.)

Cinnamic Acid, Microchemical Detection of and Distinction of from Benzoic Acid, especially in Resins. O. Tunmann. (*Pharm. Zentralh.*, 1913, **54,** 133.) Many vegetable secretions, such as resins and balsams, contain cinnamic acid. From these a crystalline sublimate is readily obtained by the method of microsublimation (*Y.B.*, **1912,** 203, 204.) The sublimates obtained from storax and Peru or Tolu balsams show somewhat larger crystals than those obtained from pure cinnamic acid, from the presence of esters. The sublimate, moistened with a drop of $KMnO_4$ solution, develops the odour of benzaldehyde, which distinguishes it from ferulic acids, which however has a different crystalline form. Benzoic acid, which often occurs in resins side by side with cinnamic acid, is less easy to distinguish. Benzoic acid sublimes before cinnamic acid. Its crystals show up under polarized light with the Nichol's prisms crossed only as grey, do not completely extinguish the light, and are seldom well formed. Cinnamic acid crystals and those of its esters show a play of light with all colours with a sharp extinction under the crossed prisms and are generally well formed. On allowing the sublimate to be exposed to the air, the benzoic acid disappears in a few days. On treating the crystals with $AgNO_3$ reagent cinnamic acid and its esters turn brown and lose their play of colours under polarized light, being only grey ; they are partly soluble. Benzoic acid crystals are readily soluble and the solution soon shows a deposit of well-formed polarizing crystals of silver benzoate. Br vapour changes cinnamic acid to yellow oily drops. Benzoic acid is unaltered. If after leaving the crystals exposed to Br vapour for thirty minutes, they are touched with a drop of CS_2 and covered with a cover glass, after a time characteristic tufts of leaflets of dibromo-cinnamic acid will be formed. Styracin, cinnamyl cinnamate, does not give a crystalline sublimate, but forms oily drops on the cover, which do not readily dissolve in alcohol. Cinnamic acid is readily dissolved.

Citric Acid, Gravimetric Determination in Presence of Tartaric and some other Organic Acids. L. Gowling Scopes. (*Analyst*, 1913, **38,** 12.) A reagent is prepared in the following manner : 51 Gm. of $Hg2NO_3$ and 51 Gm. of $Mn2NO_3$ are covered with about 68 c.c. of strong HNO_3. About 100 c.c. of water

is added, and when solution is complete the volume is made up to 250 c.c. with water. A quantity of the substance containing not less than 0·001 Gm. nor more than 0·04 Gm. of citric acid is exactly neutralized to phenolphthalein with N/10 alkali. Ten c.c. of the above reagent is added, and the whole is diluted to 200 c.c. The mixture is boiled for three hours under a reflux condenser. The precipitate, after washing by decantion, is collected on a tared Gooch crucible, again washed, and then dried for five hours. It is then weighed. The weight × 0·1667 = the amount of citric acid. In presence of tartaric, succinic, oxalic, benzoic, phosphoric, sulphuric and acetic acids, the results are accurate. With malic, lactic and salicylic acids present they are only approximate.

Cyanogen and HCN, Simultaneous Determination of. F. H. Rhodes. (*J. Ind. Eng. Chem.*, 1912, **4**, 652.) HCN is rapidly and quantitatively absorbed by a slightly acid solution of $AgNO_3$ with the formation of AgCN. $(CN)_2$ is not absorbed by this solution and any $(CN)_2$ that may be dissolved as such in it is quantitatively removed when a current of air is passed through the liquid. (CN_2) may be detected in the presence of HCN even when the total volume of cyanogen in the gas mixture is as small as 0·3 c.c. by the method given below. Hydrogen cyanide and cyanogen may be determined rapidly and accurately in the presence of each other.

The gas containing a mixture of HCN and (CN_2) is led through a series of four absorption tubes, the first two tubes containing 5 c.c. of a N/10 $AgNO_3$ solution and one drop of dilute HNO_3. The third tube contains 10 c.c. N/2 KOH solution free from KCl, and the last tube 5 c.c. of this solution. The mixture of gases is driven through this apparatus by a slow current of air which is continued for about thirty minutes. The first two tubes are then disconnected and after removing the AgCN the remaining $AgNO_3$ is titrated in the usual manner by Volhard's method with AmCNS.

The alkaline contents of the third and fourth tubes is transferred to a beaker and a known volume in excess of a N/10 $AgNO_3$ solution is added. The solution and the suspended precipitate are then thoroughly stirred, and dilute HNO_3 added until the precipitated Ag_2O is redissolved and the solution is slightly acid. The precipitate of AgCN is now filtered off, and the remaining $AgNO_3$ in the filtrate determined by means of

N/10 AmCNS solution with iron alum indicator. The $(CN)_2$ present in the original gas mixture is then calculated, the reactions involved being :—

$$(CN)_2 + 2KOH = KCN + KCNO + H_2O.$$
$$KCN + AgNO_3 = AgCN + KNO_3.$$
$$AgNO_3 + KCNS = AgCNS + KNO_3.$$

If merely the detection of (CN_2) is required, the alkaline liquid is treated with $FeSO_4$, Fe_2Cl_6 and made acid with H_2SO_4, when a blue or green colour will indicate the presence of (CN_2) in the original gas.

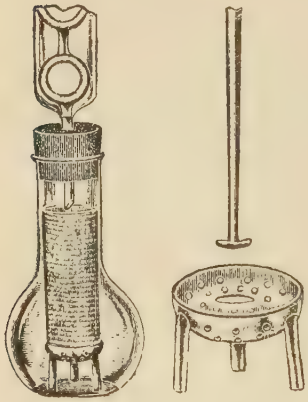
Elaterium. (*Southall's Report*, 1913, **21,** 12.) The assay of a parcel of elaterium of home production gave the following figures: Soluble in boiling alcohol (90 per cent.), 50·79 per cent.; elaterin, 20·87 per cent.

Ether, Purification of. G. Guerin. (*J. Pharm. Chim.*, 1912, **5,** 212.) The ether is shaken in a separator for thirty minutes, preferably by mechanical means, with 3 per cent. of Denigès' acid mercuric sulphate reagent, and allowed to separate. The washing in this manner is repeated as long as the reagent shows any signs of reduction. It is then filtered, and left over CaO and fused $CaCl_2$, with frequent agitation. After filtration, it is distilled. The Et_2O thus obtained is pure, except for the presence of a trace of moisture. It is well adapted for anæsthetic use.

Ethyl Butyrate. (*Evans' Analyt. Notes*, 1912, **7,** 34.) Five samples examined were impure, containing other esters (probably of acetic and propionic acid), equivalent to 11 per cent. of ethyl acetate.

Formaldehyde, Determination of. F. Herrmann. (*Pharm. Zentralh.*, 1912, **53,** 1249.) About 4 c.c. of the solution is accurately weighed into a stoppered flask. Four Gm. of powdered AmCl is added; then 25 c.c. of 2N/NaOH; the mixture is well agitated and allowed to stand, well stoppered until the temperature falls to normal. It is then diluted with 50 c.c. of water and the remaining NaOH is titrated with N/H_2SO_4 and methyl orange indicator. The number of c.c. of acid used subtracted from $50 \times 0{\cdot}06$ = the weight of formaldehyde.

Extraction Apparatus, New Form of. (*Pharm. Zentralh.*, 1913, **54**, 89.) This form of extractor is very compact and is claimed to be efficient. It consists of a somewhat short flask with a wide neck. The cartridge containing the substance to be extracted is supported on a perforated tripod. The solvent is poured on the material so that the percolate attains a height of about 1·5 Cm. or, when boiling, does not touch the cartridge. The condenser is then attached, and extraction performed in the usual manner. The tripod is lowered into the flask, and withdrawn when the extraction is completed, by means of the rod with the flattened elliptical head. This fits into the elliptical aperture of the tripod, so that when the rod is half turned the stand may be lifted up.



Formaldehyde, Determination of, in Liquor Formaldehydi Saponatus. R. Brieger. (*Apoth. Zeit.*, 1913, **28**, 214.) Ten Gm. of the sample, in a 100 c.c. flask, is treated with a slight excess of $BaCl_2$ solution, to precipitate the soap, and made up to 100 c.c. After thorough mixing, the liquid is filtered and exactly 5 c.c. of the filtrate is treated with 50 c.c. of N/10 I solution, then with NaOH solution (free from $NaNO_2$), added drop by drop, until the colour of I is discharged. After ten minutes the mixture is rendered acid with dilute H_2SO_4 and the liberated I titrated with N/10 thiosulphate. The number of c.c. of this used subtracted from 50 and $\times$ 0·3 gives the equivalent of formaldehyde, according to the equations—

$$2NaOH + I_2 = NaOI + NaI + H_2O$$
$$HCOH + NaOI + NaOH = HCOONa + NaI + H_2O$$

By another method 50 c.c. of the above filtrate from the Ba precipitate is treated with phenolphthalein indicator and enough N/KOH to give a permanent red colour. Fifty c.c. of 1 : 4 Na_2SO_3 solution is then added and after ten minutes the mixture is titrated with N/HCl. The number of c.c. n is noted. Then the amount of N/HCl necessary to neutralize 50 c.c. $-n$ of the Na_2SO_3 solution made up to 100 + m c.c. This figure is m.

The percentage of HCOH is found by the formula $(n-m) \times 0{\cdot}6$. The reaction is expressed by the equation—

$$HCOH + Na_2SO_3 + H_2O = HCOH\,NaHSO_3 + NaOH.$$

Galenical Preparations, Determination of Alcohol in. C. H. Briggs. (*J. Indust. Eng. Chem.*, 1913, **5**, 29.) The requirements of the American Pure Food and Drug Law as to the declaration of alcoholic strength of galenical preparations are causing much trouble to manufacturers. It is considered that the statement on the label of the maximum alcoholic strength is not sufficient, but that actual spirit strength of the particular sample should be declared. It would be comparatively easy to comply with the first requirement; but to meet the second, either every batch of a preparation would have to be assayed, and the amount of alcohol found marked on the label: or a printed label declaring a definite amount of alcohol could be used, and the spirit strength of the preparation adjusted thereto. It is obviously impossible to prepare galenicals from crude drugs which shall be constant in alcoholic strength.

Reviewing the question of alcohol determinations the author alludes to causes of error—

1. *In Measuring the Sample.*—An error of only 0·1 c.c. in measuring the sample means that a 90 per cent. alcohol will test 89·6 per cent. and 50 per cent. alcohol 49·8 per cent. Then there is another similar error in adjusting the distillate to the definite volume required for taking the sp. gr.

2. *Loss of Alcohol on Distillation.*—There seems to be a slight loss of alcohol on distillation. It is not possible to recover *all* the alcohol from a liquid of more than 50 per cent. strength unless it is diluted with water and double the amount of distillate is collected. This multiplies the error in the sp. gr. by two. Adding NaCl to the alcohol solution in the flask before distilling does not affect the results.

3. *Errors in Taking Specific Gravity.*—An error of 1 point in the fourth place, or say 0·9541 instead of 0·9540, means an error of about 0·2 per cent. alcohol.

The Westphal balance is not sensitive to better than 1 point in the fourth place, and it requires careful work to get it that closely. The pycnometer method is more accurate but requires a much longer time, which is a very important consideration where a large number of determinations have to be made.

4. *Temperature of Solution when Taking Specific Gravity.*—

This may cause considerable error and this point must be watched very carefully.

5. *Essential Oils and Extractive Oils.*—Small quantities of essential oils distil over and increase the sp. gr. and lower the alcohol results. Drug extractive also occasion a loss, equivalent in many cases to about 1 per cent. of alcohol. (See also *Y.B.*, **1903,** 23 ; **1908,** 299.)

[The above abstract indicates the difficulties which arise under unduly stringent and ill-considered official regulations on matters dealing with galenical preparations. In this country no difficulty is found in meeting the requirements of the Excise, in the matter of declaration of spirit strength for "drawback" on exportation, when careful alcoholic assays are conducted.—Ed., *Y.B.*]

Glycerin, Determination of, in Suppositories. C. E. Vanderkleed and F. Heidlberg. (*Amer. J. Pharm.*, 1913, **85,** 80.) Half of a suppository—about 2 Gm.—is dissolved in a separator with hot water acidified with H_2SO_4 and shaken out with Et_2O, thereby separating the stearic acid. The aqueous solution is evaporated to a small volume, then transferred to a 250 c.c. volumetric flask and filled to the mark with water.

Twenty-five c.c. of the filtered solution is measured into a 250 c.c. volumetric flask, 35 c.c. of standard $K_2Cr_2O_7$ is added, and lastly 25 c.c. of H_2SO_4 is added slowly with constant rotation to avoid ebullition. The flask is then transferred to a boiling water-bath for 20 minutes, cooled, and filled to the mark. In 25 c.c. of this solution the excess of standard $K_2Cr_2O_7$ is determined by adding 20 c.c. of KI solution and titrating against N/10 thiosulphate. One c.c. of standard $K_2Cr_2O_7$, is equivalent to 0·01 glycerin.

The bichromate solution is made by dissolving 74·615 Gm. recrystallized potassium bichromate in distilled water, adding 150 c.c. sulphuric acid and making up the volume to 1,000 c.c. at 20°C.

Glycerin in Fats, A New Method for the Determination of. S. H. Bertram. (*Chem. Weekblad*, **10,** 237–9 ; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 1689.) Twenty Gm. of the fat is saponified with alcoholic KOH, the fatty acids separated by the addition of AcOH ; the fatty acids filtered off and washed ; the filtrate neutralized with KOH, then the organic matter precipitated by lead acetate until an additional drop gives no fur-

ther precipitate, finally filtered, washed and made up to 1 litre. One hundred c.c. of the filtrate are now made alkaline with a large excess of N_2 KOH solution and a 10 per cent. solution of $CuSO_4$ is added until a permanent precipitate forms. It is now at once filtered and washed a few times. The filtrate is coloured blue from the Cu-glycerol compound. It is acidified with AcOH, an excess of KI added and the free I titrated with N/10 hypo. The Cu combines with the glycerol in the ratio of 1 Cu to $2C_3H_5(OH)_3$; hence 1 $Na_2S_2O_3$ = 1 I = 1 Cu = 2 $C_3H_5(OH)_3$. The results are not influenced by the presence of other compounds containing OH groups which occur in waxes, as are those obtained by the "acetin" method, nor by the presence of other organic matter, as are those from the oxidation method with bichromate. The above is a modification of Muter's method, with which the author was unacquainted until the conclusion of his experiments.

Glycerophosphates, Preparation, Constitution and Solubilities of. — Rogier and — Fiore. (*Bull Sci. Pharm.*, 1913, **20,** 7, 72.) After reviewing the published literature of the subject the author deals in detail with the following salts. *Sodium glycerophosphate.*—The crystalline disodic salt of Poulenc, $Na_2C_3H_7O_2PO_4 \cdot 5H_2O$, is taken as the original salt from which the others are prepared. The saturated aqueous solution contains 27·33 per cent. of the salt at 18°C. It occurs in two crystalline forms—large, with 6 mols. H_2O, and small, with 5 mols. The latter is more often met with. *Calcium glycerophosphate* is prepared by the double decomposition of the above sodium salt 3·06 Gm., dissolved in water 8 c.c., with $CaCl_2$ (anhydrous) 1·8 Gm., dissolved in water 3 c.c. Precipitation does not occur at once ; but a slight rise in temperature brings it about. A temperature of about 40°C. is most favourable. It forms anhydrous micro-crystals, $CaC_3H_7O_2PO_4$. The saturated aqueous solution contains 1·8 per cent. of the salt at 18°C. *Barium glycerophosphate* is obtained in crystalline scales in a similar manner. Precipitation occurs at once at 80°C. The salt contains 1 mol. H_2O ; $BaC_3H_7O_2PO_4 \cdot H_2O$. The saturated solution contains 4·5 per cent. of the salt at 21°C. *Strontium glycerophosphate* is obtained crystalline by the double decomposition of sodium glycerophosphate with $SrBr_2$. It contains 2 mols. H_2O. *Quinine glycerophosphate* is obtained by dissolving quinine hydrochloride, 15 Gm., in water 500 c.c., and sodium glycerophos-

phate, 15 Gm., in water 500 c.c. The mixed solutions are heated to boiling. On cooling quinine glycerophosphate $(C_{20}H_{24}N_2O_2)_2 C_3H_7O_2PO_4 \cdot 4H_2O$ separates out in well formed crystals. The cold saturated solution contains 1·28 per cent. of the salt. *Strychnine glycerophosphate.*—This cannot be prepared by double decomposition. On mixing solutions of sodium glycerophosphate and strychnine hydrochloride, the crystals formed are merely strychnine. The greater part of the so-called strychnine glycerophosphates of commerce is also merely strychnine. The acid salt can only be obtained by combining free glycerophosphoric acid, obtained by precipitating the sodium salt as lead glycerophosphate and liberating the acid from this. One mol. of strychnine neutralizes 1 mol. of glycerophosphoric acid, forming well formed needles,

$$OP\begin{cases} OC_3H_7O_2 \\ OC_{21}H_{22}N_2O_2 \\ OH \cdot H_2O \end{cases}$$

when precipitated from aqueous solution with Et_2O. M.p. 260°C., very soluble in water. *Brucine glycerophosphate*, on the other hand, can be obtained by the double decomposition of sodium glycerophosphate and brucine hydrochloride. It forms fine prismatic crystals of the neutral salt,

$$OP\begin{cases} OC_3H_7O_2 \\ OC_{23}H_{26}N_2O_4 \\ OC_{23}H_{26}N_2O_4 \cdot 11H_2O \end{cases}$$

M.p. 192°C., sparingly soluble in water. Two *copper glycerophosphates* are also described. (See also *Y.B.*, **1908,** 86; **1909,** 39; **1912,** 180.)

Guaiacol-Ferric Salts. R. F. Weinland and K. Binder. (*Berichte*, 1912, **45,** 2498.) When guaiacol is added to an alcoholic solution of ferric acetate in presence of an alkali, a definite crystalline compound is formed. Thus when ferric acetate, in solution in EtOH, guaiacol and NH_3 in solution in EtOH are mixed, a precipitate of insoluble micro-prisms is obtained, having the constitution $(Fe[O \cdot C_6H_4 \cdot OCH_3]_4NH_4$. It will thus be seen that the guaiacol iron compound is a monobasic tetra-guaiacol ferric acid. The analogous K salt occurs in four-sided prisms, and the Na salt in transparent four- or six-sided scales.

Hydrocyanic Acid, Formation of, by Action of Nitric Acid on

Tannin. R. Douris and A. Wirth. (*Bull. Sci. Pharm.*, 1912, **19,** 495.) Tannin in aqueous solution does not precipitate $AgNO_3$. If HNO_3 is added and the mixture is boiled, a bulky white microcrystalline precipitate is formed. This proves to be AgCN. The same reaction occurs with other substances allied to tannin, but pyrogallol and hydroquinone reduce $AgNO_3$ so energetically that the reduced Ag masks the AgCN simultaneously formed.

Ichthyolammonium, Composition of. H. Beckurts and H. Frerichs. (*Arch. Pharm.*, 1912, **250,** 478.) Ichthyolammonium contains about 56 per cent. non-volatile material, 11 per cent. total S, 3·0 per cent. total NH_3, 6·1 per cent. $(NH_4)_2SO_4$, and 0·06 per cent. ash. The composition is not quite constant in all ichthyols. Total S was determined by digesting with HNO_3, fusing the residue with KNO_3 and Na_2CO_3 in a Ni crucible and precipitating a solution of the fused mass with $BaCl_2$. SO_3 was determined by precipitating the ichthyolsulphonic acid with albumin, filtering, and precipitating the cold filtrate with $BaCl_2$; it was calculated to $(NH_4)_2SO_4$, and after determining the total NH_3 the balance of the latter not required for $(NH_4)_2SO_4$ was calculated as sulphonate. S as sulphide was determined by difference.

Iodotannin Compound, Nature of. C. Courtot. (*J. Pharm. Chim.*, 1912, **6,** 253.) Considerable diversity of opinion has been expressed as to the nature of the compound formed from iodine in the process of making iodotannin syrup. The author has stated it to be a definite iodotannin compound. Goris contends that the greater part of the I is converted into HI. Courtot now shows that when the solution of the reaction product of iodine and tannin is deprived of free tannin by means of hide powder and filtered, that the solution on evaporation leaves pale yellow crystals of the iodotannin compound, drawings of which are reproduced. This substance is very unstable and forms the source of iodine to which the therapeutic activity of the syrup is due.

Ipuranol, Cluytianol, Citrullol, and Related Compounds, Formulae of. F. Tutin and H. W. B. Cooper. (*Proc. Chem. Soc.*, 1913, **28,** 317.) Further examination of the alcohol, ipuranol, isolated by Power and Rogerson from *Ipomoea purpurea* (*Y.B.*, **1908,** 98), shows that it is a trihydric alcohol

having the formula $C_{29}H_{47}O_2(OH)_3$ and not $C_{23}H_{38}O_2(OH)_2$, as originally stated.

Cluytianol has also been re-examined and results agreeing with the formula $C_{29}H_{46}O(OH)_4$ and not $C_{23}H_{37}O(OH)_3$ as previously considered.

Citrullol, the alcohol found by Power and Moore in colocynth (*Y.B.*, **1910,** 166), is also found to have the formula $C_{28}H_{45}O_2(OH)_3$ and not $C_{22}H_{36}O_2(OH)_2$. Probably some of the other alcohols related to ipuranol will be found on re-investigation to possess higher formulae than those at first attributed to them.

Iron Glycerophosphate. (*Evans' Analyt. Notes*, 1912, **7,** 42.) A sample estimated gravimetrically was found to contain 23·3 per cent. of Fe_2O_3, and to leave on ignition 49·84 per cent. of residue (which appeared to be a ferroso-ferric pyrophosphate with a blue colour); it lost moisture at 115°C. to 12·1 per cent.

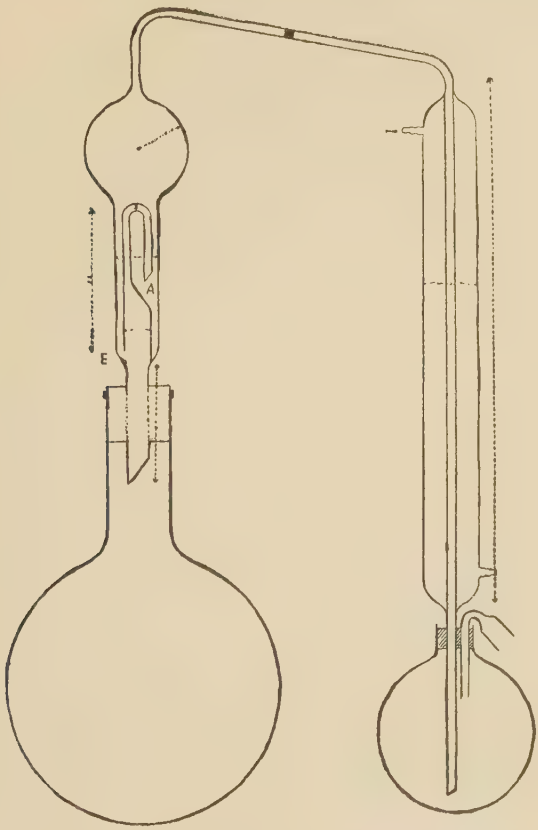
This preparation, like many others of the scale type, is evidently indefinite, the composition not agreeing with published formulae.

Merck states that the preparation contains 14 to 15 per cent. iron (20 to 21·4 per cent. Fe_2O_3), determined volumetrically with KI, HCl and $Na_2S_2O_3$, but this method may give very incorrect results, since the above sample strictly subjected thereto, indicated only 8·3 per cent. Fe_2O_3.

Kjeldahl Method for N Determination, Modified Apparatus for. G. Delattre. (*J. Pharm. Chim.*, 1913, **7,** 395.) The chief feature of the apparatus is the special splash trap, by means of which it is claimed that all contamination of the distillate with NaOH mechanically carried over in the vapour is avoided. At the moment of boiling, the vapour strikes a relatively cooled surface at A; the vesicles of NaOH are arrested and run back into the flask by the aperture, E. Nothing but ammoniacal vapour passes into the distillate. It is claimed that a distillation, which with ordinary apparatus takes an hour to complete, may be finished in 12 to 15 minutes with the apparatus figured on page 201.

Lactuca Rubber. C. P. Fox. (*J. Amer. Chem. Soc.*, 1913, **5,** 477.) In the U.S.A. two composites, *Lactuca canadensis* and *L. scariola*, are widely distributed and yield an abundant latex when cut or bruised. From this, rubber of good quality was isolated to the extent of 2·19 per cent. from *L. canadensis* and 1·58 per cent. from *L. scariola* juice. It is suggested that the com-

bined production of lactucarium and rubber might be a possible industry.



Licorice Extract and Licorice Root, Analysis and Constituents of. P. A. Houseman. (*Amer. J. Pharm.*, 1912, **84,** 531.) ANALYSIS OF LICORICE EXTRACT.—The author employs the following method, which is a modification of that already published by Parry.

Moisture and Ash are determined in the usual manner. *Matters insoluble in cold water.*—Two Gm. of the extract is spread on the sides of a small, copper gauze basket, which is placed in a 100 c.c. cylindrical glass tube, drawn out to a conical end, and containing about 75 c.c. of distilled water. The tube is closed

with a rubber stopper and agitated in a shaking machine until the paste is completely disintegrated ($\frac{1}{2}$ hour to 1 hour); then centrifugated for 15 minutes. The clear liquor is poured off, the sediment stirred up with fresh water and whirled for a further 15 minutes. After pouring off the liquor, the sediment is washed into a tared glass dish, evaporated and weighed. Most freshly made licorice pastes will contain not more than 3 per cent. by weight of matters insoluble in cold water, unless made from very starchy root or from liquor which, having been partly chilled, contains gelatinized starch. A paste containing more than this amount should be dissolved without the aid of a shaking machine by suspending in cold water, as the use of the shaking machine is found to give low results with pastes containing much insoluble matter. Many experiments have shown that 15 minutes is a sufficient time to centrifuge at 1,000 revolutions, the results being identical with those obtained by 24 hours settling in a tall jar. *Matters insoluble in hot water.*—This estimation is carried out in a similar manner to the preceding determination, using hot water. *Starch and Gums.*—Two Gm. of licorice mass is dissolved in 10 c.c. of hot water, in a centrifuge tube similar to that used for "matters insoluble in cold water." The solution is cooled and 20 c.c. of 80 per cent. alcohol is added with stirring. Fifty c.c. of 95 per cent. alcohol is then added gradually with stirring. After allowing to stand 2 hours, the contents of the tube are centrifugated. After pouring off the clear liquor, the precipitate is stirred up with 80 per cent. alcohol and centrifugated. This operation is carried out three times in all. The precipitate, consisting of starch and gums, and of the mechanical impurity in the paste, is washed into a tared dish, evaporated and weighed. The mechanical impurities (matters insoluble in hot water) are deducted, to give the weight of starch and gums. *Glycyrrhizin.*—The clear 80 per cent. alcoholic liquor, poured off from the starch and gums, is evaporated just to dryness *in vacuo* on a water-bath. The residue is transferred to a small conical beaker with 30 c.c. water and after cooling to 15°C., the crude glycyrrhizin is precipitated with 3 c.c. dilute H_2SO_4 (10 c.c. concentrated H_2SO_4 to 300 c.c. water). After standing for 2 hours at a temperature of about 10°C., the mixture is cooled in ice for half an hour, and the clear supernatant liquor poured through a small filter. The glycyrrhizin is washed four times by decantation with ice water, in which it is practically insoluble. The glycyrrhizin in the

beaker, together with any that may have been transferred to the paper, is dissolved in dilute EtOH. Two drops of 5 per cent. AmOH are added to neutralize traces of H_2SO_4, and the solution is transferred to a tared dish, evaporated, and the crude glycyrrhizin weighed. *Sugars.*—The filtrate and washings from the glycyrrhizin, amounting to about 70 c.c., are received in a 100 c.c. graduated flask. Enough of a concentrated solution of basic lead acetate is added to precipitate both the H_2SO_4 and the resins, bitter substances, colouring matters, etc. (3 c.c. are usually sufficient). The liquid is made up to 100 c.c. and filtered into a 100 c.c. graduated cylinder. The excess of Pb is exactly removed with Na_2CO_3, the liquid made to 100 c.c. again, filtered, and titrated with Fehling's solution before and after inversion.

In the following table the results of the analyses of licorice extracts, manufactured under the author's supervision, are given. The roots were treated in open copper digestors provided with a steam inlet at the bottom, through which just enough steam was admitted to keep the liquor boiling. Five liquors were drawn off at intervals of thirty minutes, and the spent root finally pressed to remove adherent liquor. The liquors were evaporated in a steam-jacketed copper pan. The results are calculated to 10 per cent. root moisture and 25 per cent. moisture in the extract.

ANALYSES OF LIQORICE EXTRACTS.

Kind of Root.	Yield of Extract. Per cent.	Per cent. Glycyrrhizin.	Per cent. Starch and Gums.	Per cent. Total Sugars.	Per cent. Ash + Extractive and Colouring Matter.
Russian . . .	27·6	24·14	23·24	9·56	18·06
Syrian	26·2	19·43	18·20	19·81	17·56
Anatolian . . .	40·6	21·96	16·37	16·89	17·56
Turk-Arabian . .	27·3	20·15	17·84	14·71	22·30
Italian	41·1	15·76	23·74	17·18	18·32
Spanish-Cordoba .	37·7	14·32	24·08	9·37	27·23

A stronger extraction under 35 pounds steam pressure, corresponding to 138°C., tends to lower glycyrrhizin and sugars, and to increase starch and gums. The results below are not from the same samples of roots as those in the above Table.

ANALYSES OF LICORICE EXTRACTS MADE AT 35 LBS. STEAM PRESSURE.

Kind of Root.	Yield of Extract. Per cent.	Per cent. Glycyrrhizin.	Per cent. Starch and Gums.	Per cent. Total Sugars.	Per cent. Ash + Extractive and Colouring Matter.
Russian . . .	46·6	15·60	30·57	11·77	17·06
Syrian	41·0	14·43	30·47	11·26	18·84
Anatolian . . .	54·0	15·41	28·63	9·36	21·60
Italian	52·0	12·47	29·84	14·70	17·99
Spanish-Cordoba .	54·2	12·18	33·01	8·61	21·20

Detailed criticism of other methods of analysis follow.

TREATMENT OF LICORICE ROOT WITH SOLVENTS.—*Extraction with Petroleum Ether.*—Licorice root yields less than 1 per cent. of its weight to petroleum ether.

Anatolian root yielded 0·32 per cent. of a brown, bitter, semi-solid extract, with an unpleasant odour. On slow evaporation colourless, needle-shaped crystals separated from the syrup. These are practically insoluble in petroleum ether. EtO_2 and EtOH, but may be crystallized from warm C_6H_6 or $CHCl_3$. Further examination of these crystals is contemplated.

Italian root (green) yielded 0·95 per cent. of petroleum ether extract.

Syrian root yielded 0·54 per cent. of a darker brown colour than the petroleum ether extracts from the other roots.

Extraction with $CHCl_3$.—When a $CHCl_3$ extract of licorice root is evaporated, a mixture of colourless crystals with a yellow fatty substance is obtained. The latter is readily removed by Et_2O. On crystallizing the residue from $CHCl_3$, brilliant fine white needles were obtained, readily soluble in $CHCl_3$ and C_6H_6, insoluble in petroleum ether, EtOH, Et_2O, and water. The yield was about 0·05 per cent. Detailed investigation of a larger quantity is contemplated.

The results of the action of other solvents on the root are tabulated in the following manner.

Substances Soluble in Ether, 95 per cent. Alcohol and 50 per cent. Alcohol.

Kind of Root.	Resins sol. in 95 per cent. EtOH and in Et_2O.	Bitter principles, etc., sol. in water.	Bitter principles, etc., insol. in water.	Glycyrrhizin.	Sugars.	Other substances sol. in 50 per cent. Alcohol.	Total extraction with 95 per cent. and 50 per cent. Alcohol.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Russian	4·12	3·05	2·29	9·88	6·75	9·52	35·61
Syrian	3·03	3·07	3·08	7·44	6·41	9·16	32·19
Anatolian . . .	2·35	3·62	3·52	13·24	7.43	13·18	43·34
Turk-Arabian [1] . .	1·75	3·92	4·18	8·87	6·92	10·12	35·76
Italian	2·82	3·38	3·78	9·18	5·32	12·08	36·56
Spanish-Alicante .	3·27	3·31	2·58	10·06	8·42	12·05	39·69
Spanish-Cordoba .	2·96	3·18	3·20	8·37	5·69	9·74	33·14
Spanish-Zaragossa .	2·07	3·05	2·93	7·41	4·66	16·09	36·21
Spanish-Seville . .	2·00	3·31	3·47	7·16	8·47	10·30	34·71
Spanish-Toledo . .	2·26	3·38	2·93	5·89	5·36	13·03	32·85

[1] The Turkish-Arabian root was not of a very good quality.

The Anatolian contains the highest percentage of glycyrrhizin, but also larger amounts of the other constituents. The bitter principles soluble in water are very uniform in the whole ten roots. Russian root contains the most resins.

In actual practice, with water extraction, most of the resin remains in the exhausted root.

In the following table the loss of glycyrrhizin during the process of extraction is shown. This occurs mainly during the heating.

Kind of Root.	Per cent. Glycyrrhizin in original Root.	Glycyrrhizin in paste, calculated as per cent. of Root.	Loss, as per cent. of Root.	Per cent. decomposed of total Glycyrrhizin.
Russian	9·88	7·10	2·78	28·1
Syrian	7·44	5·43	2·01	27·0
Anatolian	13·24	9·52	3·72	28·1
Turkish-Arabian . . .	8·87	5·91	2·96	33·3
Italian	9·18	6·91	2·27	24·7
Spanish-Alicante [1] . .	10·06	4·90	5·16	51·3
Spanish-Cordoba . . .	8.37	5·76	2·61	31·2
Spanish-Zaragossa . .	7·41	5·01	2·40	32·4
Spanish-Seville . . .	7·16	4·88	2·28	31·8
Spanish-Toledo . . .	5·89	4·28	1·61	27·3

[1] The result on Alicante should be rejected. A delay caused fermentation to commence in the liquor.

Therefore, nearly one-third of the glycyrrhizin originally present is lost by the ordinary method of water extraction, presumably by decomposition. None is left in the residual marc. (See also *Y.B.*, **1912,** 175.)

Licorice Juice. (*Evans' Analyt. Notes*, 1912, **7,** 49.) Nine samples of the Italian stick juices have varied as follows: Glycyrrhizin, 10 to 15 per cent.; water insoluble matter, 19·3 to 28 per cent.; alcohol insoluble matter, 36 to 44 per cent.; moisture, 13·3 to 20 per cent.; ash, 3·6 to 5·1 per cent. Five samples of "block juice" of Anatolian type had: Glycyrrhizin, 22 to 24 per cent.; water insoluble matter, 10 to 13 per cent.; alcohol insoluble matter, 24 to 33 per cent.; moisture, 17·5 to 20 per cent.; ash, 6·1 to 7 per cent.

Lygosin, a New Indicator. A. Ferencz. (*Pharm. Post*, 1913, 521; *Apoth. Zeit.*, 1913, **28,** 468.) This is othodioxydibenzalacetone. It is easily prepared by condensing two mols. of salicylic aldehyde and one mol. of acetone, in solution in EtOH, with strong NaOH solution. This separates an amorphous Na salt from EtOH, which on treatment with dilute acid liberates lygosin. A 1 : 100 EtOH solution of this is a sensitive indicator for alkalies. With acids it gives a faint turbidity; with alkali an orange red colour. It is a substitute for phenolphthalein, and like that indicator cannot be used for AmOH titration.

Magnesium Glycerophosphate. (*Evans' Analyt. Notes*, 1912, **7,** 51.) A sample examined gave the following results: Magnesium = 8·9 per cent.; loss at 115°C. = 8·0 per cent.; loss at 150°C. = 12·5 per cent.; residue on ignition = 49·5 per cent. The magnesium was estimated by ordinary direct precipitation and ignition to pyrophosphate, and the figure found is, if correct, equivalent to a $4H_2O$ compound (equivalent to 27 per cent. water). The actual recorded loss on heating is certainly suggested of a salt with some degree of hydration. The ignited residue consisted chiefly of pyrophosphate. A rapid volumetric estimation may be effected precisely as recorded under calcium glycerophosphate.

Melting Point of High Melting Substances. E. Havas. (*Chem. Zeit.*, 1912, **36** [148]; *Pharm. Zeit.*, 1913, **58,** 127.) Fusible metal, composed of Sn, 2; Pb, 2; is used as the bath. This is melted in a porcelain crucible and a particle of the substance is placed on the surface. The bulb of the thermometer

is immersed in the bath and the heat gradually applied. The critical point is easily observed on the bright surface of the molten alloy. By using a nitrogen thermometer, m.p.'s at 460°C. are easily determined.

Micro-Analytical Methods for Food and Drugs Laboratories. A. Schneider. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 1338; 1913, **2**, 6.) Details of the reagents used and the methods of manipulation in drug micro-analysis are given.

Muira Puama, Liriosma Ovata, Extract, Distinctive Reaction for. C. Griebel. (*Apoth. Zeit.*, 1913, **28**, 85.) If about 1 c.c. of the extract is evaporated to dryness on the water-bath, and the residue is treated with Et_2O, on evaporating the Et_2O to about 1 c.c. and adding a few drops of strong H_2SO_4 a marked green fluorescence will appear in the presence of extract of *Liriosma ovata*.

Neosalvarsan and Salvarsan, Reactions and Determination of. G. Denigès and A. Labat. (*Bull. Soc. Pharm. de Bordeaux; Rèpert. Pharm.*, 1913, **25**, 9.) HCl and $HC_2H_3O_2$ are useful reagents to differentiate neosalvarsan from salvarsan. With HCl neosalvarsan gives a precipitate, soluble on boiling, reappearing on cooling. Salvarsan gives no precipitate. With $HC_2H_3O_2$ neosalvarsan gives a slight precipitate, increased on heating, clotting on boiling and becoming yellow. On cooling a colloidal precipitate is formed. Salvarsan gives no such reactions. On heating a particle of neosalvarsan with 0·5 c.c. of water and 1 c.c. of Bougault's reagent in the boiling water-bath for four or five minutes, a bright yellow precipitate is formed. With salvarsan the colour of the precipitate is orange yellow. Both salvarsan and neosalvarsan may be determined quantitatively in presence of H_2SO_4 by means of N/10 $KMnO_4$ solution. The titration is conveniently performed with 10 c.c. of a 1·5 : 1,000 solution; to this 10 c.c. of water and 1 c.c. of pure H_2SO_4 are added. The mixture is warmed to 60–70°C. and titrated at that temperature. The end point is taken when the pink colour persists for about one minute. Each c.c. of N/10 $KMnO_4$ = 0·0015 Gm. of neosalvarsan.

Paraldehyde, Detection of Excess of Acetaldehyde in. G. Heyl. (*Apoth. Zeit.*, 1913, **28**.) The author recommends a modification of Lewin's reaction for certain aldehydes with piperidine and

sodium nitroprusside to detect the presence of more than 4 per cent. of acetaldehyde in paraldehyde. One Gm. of the paraldehyde is made up to 100 c.c. with water and dissolved. Ten c.c. of this solution is diluted with 50 c.c. of water. To 10 c.c. of this solution 20 drops of sodium nitroprusside solution 1 : 100, and 3 drops of piperidine are added. If a distinct blue colour is formed, the paraldehyde contains more than 4 per cent. of acetaldehyde.

Perezone. F. G. P. Remfry. (*Proc. Chem. Soc.*, 1913, **29,** 72.) The hydroxyquinone perezone (pipitzahoic acid, $C_{15}H_{20}O_3$) (*Y.B.*, **1900,** 107) is converted by the action of heat into a colourless isomeride melting at 140–141°C. (corr.), and having α_D + 13·1°, which has been termed *perezol.* This substance is phenolic, and yields a monoacetyl derivative, *acetyl perezol*, melting at 114–115°C. (corr.), and having α_D + 6·2°. The latter is identical with the colourless compound obtained by Anschütz and Leather by the action of acetic anhydride on perezone.

Perezol and acetylperezol are, further, doubtless identical with the substances prepared by Sanders, to which, however, different formulae were assigned.

Phenols, Determination of, in Creolins. — Vandevelde. (*Bull. Soc. Chim. Belg.*; *Répertoire*, 1913, **25,** 259.) About 250 Gm. of the sample, with 500 c.c. of water, is made acid with H_2SO_4, and mixed, in a separator, with 100 c.c. of C_6H_6. After standing 24 hours, the aqueous layer is rejected, and the rest distilled, all the distillate passing over below 230–240° being collected. This distillate is shaken out with 50, 50 and 50 c.c. of NaOH solution 1 : 10. The bulked NaOH solutions are transferred to a 250 c.c. graduated cylinder, and treated with H_2SO_4 to liberate the phenols. The volume of these is then read off and the weight found by dividing by 1·0555 the mean sp. gr.; or they may be separated and weighed.

Picrotoxin, Constitution of. J. Sielisch. (*Liebig's Annalen*, 1913, **391,** 1.) The question whether picrotoxin, $C_{30}H_{34}O_{13}$, is a mixture or a definite compound of picrotoxinin, $C_{15}H_{16}O_6$, and of picrotin, $C_{15}H_{18}O_7$, has been much discussed. The author finds it to be a definite but easily decomposed compound, of equimolecular proportions of the two substances. (See also *Y.B.*, **1911,** 184.)

Potassium Glycerophosphate. (*Evans' Analyt. Notes*, 1912, **7.**) Three samples of 50 per cent. solution examined exhibited extraordinary variations. It is questionable whether the stated strength may be referred to the unusual anhydrous salt of the B.P.C., or to the more customary hydrated salt with $3H_2O$. Apparently, solutions are offered corresponding to each formula and to neither, as the following figures illustrate.

	S.G.	Ref. Ind. 15°.	Per cent. Anhydrous.	Per cent. Hydrated $3H_2O$.	Residue on Ignition.	Residue at 110°.
1	1·3314	1.4009	38·5	46·5	28·16	47·07
2	1·3327	1·4027	42·4	51·2	28·71	47·0(125°)
3	..	1·4159	52·1	63·34	..	..

The most rapid estimation is a direct volumetric one, indicating with methyl orange, against $N/2H_2SO_4$, when $N/2H_2SO_4 = 1·5$ Gm. Merck recommends as a check a further back titration with $N/2NaOH = N/2H_2SO_4$ used with phenolphthalein. The residue on ignition is substantially a pyrophosphate, and might be used as an indirect estimation. The salt only loses about half its water at 111°, and not quite the whole of it in several hours at 125°.

Pyrogallol, Sensitive Reaction for. — Gluecksmann. (*Pharm. Prax.*, 1912, 100 ; *J. Pharm. Chim.*, 1913, **7,** 130.) If a trace of pyrogallol is dissolved in 1 c.c. of glacial acetic acid and a few drops of formalin added, on boiling and adding a few drops of HCl a deep cherry-red colour is produced, persistent on dilution with acetic acid and evident in a dilution of 1 in 100,000.

Santonin, Tetra-Hydrogen Compound of. Y. Asahina. (*Berichte*, 1913, **46,** 1775.) In presence of Pt black and hydrogen santonin, in acetic acid solution, readily absorbs 2 mols. of H and forms tetrahydro santonin. The crude product is recrystallized from water in white, shining, thin plates, $C_{15}H_{22}O_3$, m.p. 155–156°. It is readily dissolved in hot water, the solutions having a fragrant odour. It is readily soluble in organic solvents.

Seaweeds, Constituents of Certain. H. Kylin. (*Zeits. Physiolog. Chem.*, **83,** 171 ; *Chem. Zentralb.*, 1913, **1,** 1523.) *Fucosan*, which occurs in the bladders of the Fucoideae, in some of its reactions and properties resembles a tannin, but it is not

glucosidal. It is coloured red by vanillin-HCl, brown by HCl, is a powerful reducing agent, is precipitated by Pb $2C_2H_3O_2$ and gelatin and has an astringent taste. It is precipitated from alkaline solutions by EtOH, but not from neutral or acid solutions. On oxidation in AmOH solution it rapidly turns brown and forms *phykophain* at ordinary temperatures; more slowly in neutral solutions and rapidly at higher temperatures and in presence of free acid. Fucosan affords no sugar when boiled with dilute H_2SO_4. Phykophain is not precipitated from acid solutions by EtOH, and not completely from neutral solutions. The white sweet substance obtained on drying *Laminaria* consists mainly of *mannitol*. The statement of Stenhouse in 1844 as to the occurrence of this sugar in *Ascophyllum nodosum*, *Fucus serratus*, *F. vesiculosus*, *Halidrys siliquosa*, *Laminaria digitata* and *L. saccharina* is confirmed. It has also been found in *L. cloustoni* and *Pylaiella litoralis*, but not in *Furcellaria fastigiata*. *Laevulose* occurs in *Ascophyllum nodosum* and in *Fucus vesiculosus*; *dextrose* in *Laminaria digitata* and *L. saccharina*. The Florideae contain small amounts of reducing sugars. In the bladders of the Fuci two closely allied carbohydrates occur, separable by precipitation with $Pb2C_2H_3O_2$. One of this is a gum-like substance, and occurs in greater quantity than the other. It is probably identical with *laminarin*: it gives pentoses. The other substance is a dextrin-like polysaccharide and performs the same physiological function as starch in the higher plants. *Laminaria digitata* and *L. saccharina* contain notable quantities of these polysaccharides; *Ascophyllum nodosum* *Fucus vesiculosus* only a negligible amount. *Laminarin* forms a white, tasteless powder, soluble in water, insoluble in absolute EtOH. From EtOH 75 per cent., on prolonged cooling, it separates in a spheroidal form. It is not coloured by I. Its aqueous solutions reduce ammoniacal lead acetate and Trommer's reagent on heating; it is laevorotatory, α_D about $-13°$, and affords only dextrose on hydrolysis. The gelatinized solution of Florideae-starch is rapidly hydrolysed by malt diastase: the unaltered grains are not, however, rendered soluble. The cell walls of *Ascophyllum nodosum*, *Fucus vesiculosus* and *Laminaria digitata* contain two gum-like substances named *algin* and *fucoidin*. Algin is a white, laevorotatory, almost insoluble in water, but soluble on addition of alkali, forming a very viscous solution. It is not coloured by $ZnCl_2$; but gives the pentose reaction with phloroglucinol-HCl and orcinol-

HCl reagents. It is oxidized with difficulty by HNO_3 and gives no mucic acid. *Fucoidin* is also laevorotatory and gives the pentose reactions. The mucilage of *Ceramium rubrum* and of *Furcurella fastigiata* solidifies on cooling, and is not precipitated by Am_2SO_4. The mucilage of *Damontia filiformis* has not these properties. Both these give the pentose reactions and form mucic acid on oxidation with HNO_3. The investigation of the sugars obtained by hydrolysis is being continued. (See also *Y.B.*, **1898,** 364; **1912,** 245.)

Soap, Olive Oil (Castile). (*Evans' Analyt. Notes*, 1912, **17,** 70.) An apparently genuine sample of the green variety had: M.p. of fatty acids, 23°; iodine value of fatty acids, 77·6; $\eta_{D30°}$ of fatty acids, 1·46; Reichert-Meissl value, soluble, 0·8; insoluble, 0·4.

Abnormal and adulterated samples had:—

	M.Pt. Fatty Acids.	Iod. Val. Fatty Acids.	Ref. Ind. (30°) Fatty Acids.	Reichert-Meissl Value.	
				Soluble.	Insoluble.
1	23·5°	59·2	1·4507	5.2	7·4
2	25°	83·8	1·458	0·6	0·4
3	27°	86·0	1·457	1·5	0·2
4	26°	90·7	1·457	0·4	0·6

No. 1 was adulterated with cocoanut oil. Nos. 2 and 3 were suspicious samples from a Spanish source, and were much too alkaline. No. 4 was a faulty sample with an oily yellow appearance, giving a very turbid solution.

Soap, Soft (Olive Oil). *Evan's Analyt. Notes*, 1913, **7,** 71). Fifty-seven samples of true olive oil soaps of the best pharmaceutical quality had free alkali equivalent to:—

In 5 Gm.		M.Pt. Fatty Acids.	Iodine Val. Fatty Acids.	Ref. Ind. Fatty Acids.
KOH. C.c. N/10.	K_2CO_3. C.c. N/10.			
0 to 1·5	0·2 to 1·5	24° to 27°	81·7 to 94·4 (mean, 88·9)	1·4565 to 1·459

Three genuine, but excessively alkaline, soaps had free alkalinity equivalent to 0·8 to 3·5 c.c. of N/10 KOH, and to 9·5 to 21·8 c.c. of N/10 K_2CO_3 in 5 Gm. of soap.

Two samples of resin free commercial soap, containing saponified fish oil, gave:—

C.c. N/10KOH in 5 Gm.	C.c. N/10K_2CO_3 in 5 Gm.	M.p. fatty acids.	Iodine value.	η_D Fatty Acids.
2·3	25·0	37°	107·8	1·4566 (40°)
1·5	26·2	30°	122·1	1·4589 (40°)

Sodium Glycerophosphate. (*Evans' Analyt. Notes*, 1913, **7,** 72.) Commercial solutions of this compound are referred to $Na_2C_3H_5(OH)_2PO_4 \cdot 3H_2O$ and not to the $\cdot H_2O$ compound. One 50 per cent. solution had the following values :—

Sp.gr., 1·3857 ; $\eta_{D15°}$ 1·4172 ; residue (110°), 49·25 per cent. ; ignited residue (pyrophosphate), 28·26 per cent. ; volumetric strength, 49·1 per cent. ($\cdot 3H_2O$).

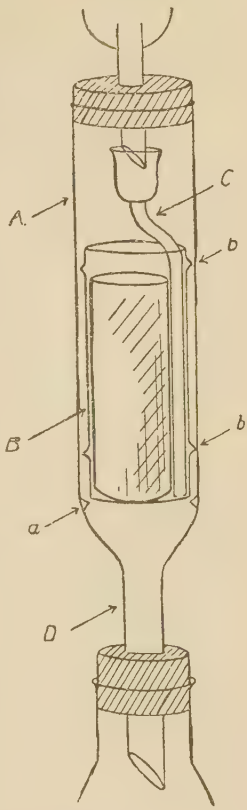
The volumetric determination was made by direct titration using methyl orange.

Sodium Methylarsinate, Preparation of. G. Favrel. (*Bull. Sci. Pharm.*, 1913, **20,** 337.) Into a stoppered flask introduce NaOH, 120 Gm., and dissolve it in water, 250 c.c. ; then add As_2O_3, 99 Gm., and agitate. The liquid becomes warm and combination rapidly takes place. When the solution has cooled add MeOH, 50 c.c., and MeI, 145 Gm. Then place in a well-stoppered mechanical agitator. At first the liquid heats rapidly, and it is necessary to cool it : yet it must be kept agitated for at least 24 hours, for reaction does not continue to be rapid. When complete, add sufficient boiling water to dissolve the precipitate formed, and gradually pour the solution, with constant agitation, into three times its volume of alcohol 90 per cent. Dissolve the precipitated sodium methylarsinate thus obtained in the minimum quantity of cold water. To this solution add sufficient $Ba(OH)_2$ until a small quantity of the liquid, withdrawn and filtered, gives a precipitate with CO_2. Usually 4 or 5 Gm. of $Ba(OH)_2$ will be required. Then set aside for 24 hours, filter, and pass a current of CO_2 through the boiling filtrate. Then cool, filter, evaporate until a pellicle forms ; then pour with agitation into three volumes of EtOH 90 per cent. The crystalline salt thus obtained contains 6 mols. H_2O.

Soxhlet's Extraction Apparatus, Modification of. W. Friese. (*Pharm. Zentralh.*, 1913, **54,** 542.) The modification consists in the abolishment of the syphon, and the substitution of a thistle funnel, C, leading the condensed solvent into the extraction vessel B. The cartridge containing the substance to be extracted is thus kept constantly beneath the surface of the hot solvent. Boiling of the liquid in the flask is regular, since the

flow from above is continuous and not intermittent as with the original syphon.

The sides of the extraction cylinder have small bosses *b* to prevent them coming into close contact with the outer cylinder A. Similar bosses, *a*, enable the extraction chamber to rest freely on the neck of the outer cylinder.



Starch, Soluble, New Form of. A. Fernbach. (*Comptes rend.*, 1912, **155,** 617.) A 1 : 50 starch paste is poured in a thin stream with constant agitation into a large volume of pure acetone. The precipitate formed is collected, and then thoroughly triturated with dry acetone. The insoluble residue is drained and dried *in vacuo*. The product is a very light, pulverulent, white mass, readily soluble 1 : 50 in cold water. The solution is easily filtered, gives all the reactions of starch and is hydrolysed by diastase. The soluble starch thus prepared is quite free from impurities which reduce Fehling's solution.

Syrups, Detection and Determination of Formic Acid in.—Kreis. (*Mitt. Lebens. Hyg.*, **3,** 205; *Chem. Abst. Amer. Chem. Soc.*, 1913, **7,** 1066.) The presence of added HCO_2H in liquids containing acids and sugars cannot be determined by qualitative methods, since HCO_2H is always formed when sugar solutions are distilled in the presence of acids. The addition of HCO_2H may be proved by quantitative methods. The amount of HCO_2H formed is dependent on the method of distillation and the concentration and acid content of the liquid under examination. The author recommends the following method: Subject 100 Gm. of the sample to steam distillation without addition of H_2SO_4. Heat the flask containing the sample in a boiling water-bath during distillation, not over a free flame.

Collect 1,000 c.c. of distillate. Under these conditions not more than 0·005 Gm. HCO_2H will result from the decomposition of sugars during distillation. The presence of more than this amount in the distillate may be taken as evidence of added HCO_2H. The following methods are most reliable for the determination of HCO_2H, in the distillate: (1) Reduction of $HgCl_2$ and weighing the HgCl which is formed; (2) neutralization of the distillate, evaporation, decomposition of the formate with strong H_2SO_4 and measurement of the evolved CO; (3) determination of the acidity of the distillate, oxidation of HCO_2H with $K_2Cr_2O_7$ and H_2SO_4, steam distillation of the oxidized mixture and titration of the distillate. The difference in acidity before and after oxidation is due to HCO_2H. (See also *Y.B.*, **1909,** 3, 37; **1911,** 194; **1912,** 173.)

Tannin, the Estimation of, in Tea. H. L. Smith. (*Proc. Soc. Pub. Analysts* : *Chem. News*, 1913, **107,** 298.) The tannin of tea may be determined by the method devised by A. C. Chapman for the determination of tannin of hops. Caffeine must first be removed from the tea infusion by extraction with $CHCl_3$. The tannin is precipitated by the addition of a saturated solution of cinchonine sulphate and the cinchonine tannate filtered off, dried, and weighed.

The precipitate contains 45 per cent. of cinchonine and 55 per cent. of tannin.

Urea in Phanerogamous Plants. R. Fosse. (*Comptes rend.*, 1912, **155,** 851.) Urea has been isolated in crystals from the juices of the following cultivated plants: endive, melon, cauliflower, turnip, spinach, carrot and potato. The material was most carefully cleansed, crushed in presence of $CHCl_3$ or KF and treated with aseptic precautions. It does not follow, however, that the urea found is a physiological product of the plant cells. It may have been absorbed as such from the soil.

Vaccinium Corymbosum Fruit, Juice of, as Indicator for Acidimetry. G. N. Watson. (*Amer. J. Pharm.*, 1913, **85,** 246.) The neutralized juice of the American blueberry, being extremely sensitive to alkali and acid, is suggested as an indicator for acidimetry. Towards CO_2 it behaves like litmus. For alkaloidal work it is equal to cochineal in sensitiveness, and shows a sharper contrast of colour change.

Veronal Poisoning, Chemical Detection of. W. Macadie.

(*Pharm. J.*, 1913, 4, **36,** 134.) In a case of suspected veronal poisoning that substance was detected in the stomach washings and the urine by the following method.

The stomach wash-out was found neutral (or amphoteric) to litmus, and was therefore made acid with HCl and shaken out repeatedly with Et_2O. The Et_2O was evaporated and the residue extracted with cold absolute EtOH, which left the fatty and most of the other foreign matter behind. EtOH extract was then evaporated to dryness, treated with a little Na_2CO_3 in water, and filtered. The filtrate was then acidified and again shaken out with Et_2O. The ether residue was then dissolved in a little alcohol. The treatment with Na_2CO_3 may be omitted in many cases, as the first alcoholic solution obtained was fairly pure.

The alcoholic solution was then divided into two parts and tested as follows: The first part was treated in a fusion tube with a few drops of alcoholic NaOH. No NH_3 was evolved until the last traces of EtOH had been got rid of. Then, when the NaOH fused, NH_3 was given off in quantity. After the bulk of the NH_3 had been evolved there remained a very characteristic and extremely persistent odour exactly like the smell of a roll of fresh jaconet sheeting. The fused residue was then treated with dilute H_2SO_4, 1 to 7, and a gas was evolved which turned lime-water milky. The odour of the acid solution was also an extremely characteristic one, somewhat like a mixture of acetic acid with a trace of butyric acid. The other half of the alcoholic solution was evaporated to dryness in a test-tube, taken up with a few drops of water, and treated with Millon's reagent and HNO_3. This gave a distinct gelatinous precipitate soluble in excess of HNO_3, not in excess of the reagent, as stated in the B.P. Codex.

The urine was of a rich orange colour, had the sp. gr. 1·025, and contained no albumin or sugar. The reaction was very alkaline, probably due to the alkaline treatment given. The rich orange colour was similar to that seen in suppressed or febrile urines, and was pink in Et_2O solution, the Et_2O residue being a pure orange. The urine was made faintly acid with acetic acid, a small quantity of saturated solution of $CaCl_2$ was added. This precipitated the urates, which carried down practically all the pigment. The filtrate was then made acid with HCl and shaken out with Et_2O as above. Veronal was present in greater quantity than in the stomach wash-out. The NaOH

test is the most characteristic and delicate test for veronal or malourea. If it is negative, then there is certainly no veronal present.

PLANT ANALYSIS

Barosma Venusta Leaves, Constituents of. H. R. Jensen. (*Pharm. J.*, 1913 [4], **36,** 60.) The leaves yielded 1·1 per cent. of essential oil to steam distillation; sp. gr., 0·8839; α_D + 0°30; $\eta_{D20°}$ 1·4967; acid value, 2·4; ester value, 13·4; acetyl value, 52·8; phenols by KOH absorption, 16 per cent.; aldehydes and ketones by Na_2SO_3 absorption, 4 per cent. The composition of the oil is given as being approximately: Hydrocarbons (myrcene), 35; phenols (chavicol), 16; alcohols (myrcenol and from sesquiterpenes), 15; ethers, phenolic (methylchavicol, anethol), 15; with sesquiterpenes, esters, ketones, aldehydes and acids up to 100. The other constituents of the leaves were resins, mucilage, glucosides, fatty matter and carbohydrates, with a trace of tannin. No alkaloid was detected. *Barosma venusta* cannot be regarded as a substitute for any of the official buchus. Its specific medicinal value, if any, has yet to be determined.

Buphane Disticha. L. Lewin. (*L'Union Pharm.*, 1913, **51,** 206.) From this amaryllidaceous South African plant, also known as *Haemanthus toxicarius*, an alkaloid named *haemanthine* by the author has been isolated, to which the formula $C_{18}H_{23}NO$ is attributed. It is toxic, being narcotic, arresting the respiration and occasioning mydriasis. In large doses it is a convulsant. On pigeons it is a more powerful emetic than apomorphine. It is suggested that it may be used in medicine as a narcotic and emetic.

[From the above extract, the author does not appear to be aware of the very complete examination of the drug by Tutin, *Y.B.*, **1911,** 197.—Ed., *Y.B.*]

Calcium Tartrate and Oxalate from Senna Leaves. T. E. Wallis. (*Pharm. J.*, 1912 [4], **35,** 644.) It has been shown that infusion of senna deposits, in the course of a few days, a quantity of crystals of calcium tartrate. Assuming that the $CaC_4H_4O_6$ exists as such in the leaves, it is suggested that possibly some of the micro-crystals found in the leaf, commonly

stated to be calcium oxalate, may be calcium tartrate. The author finds, however, that although considerable quantities of calcium tartrate are deposited from infusions of some samples of senna leaves, $CaC_4H_4O_6$ does not appear to exist, as such, in the leaf; but is produced by some action in the infusion between bodies extracted by the water from the leaf: the crystals usually described as calcium oxalate actually are oxalate and not tartrate. The best micro-chemical reagent to distinguish $CaC_4H_4O_6$ from CaC_2O_4, is a solution of NaOH which rapidly dissolves the tartrate; but has no immediate action upon CaC_2O_4. Senna leaves do not contain any crystals that can be identified as $CaC_4H_4O_6$ under the microscope; the crystals seen are undoubtedly CaC_2O_4. The liquid obtained by macerating senna leaves in cold water deposits $CaC_4H_4O_6$ on standing for a few days, so that the deposit cannot result from difference in solubility of $CaC_4H_4O_6$ in hot and in cold water. The $CaC_4H_4O_6$ is produced gradually as the result of some action taking place in the infusion after it has been made. The formation of the deposit is not accelerated by the action of the oxygen, and its accumulation is not hindered when the air is completely excluded by a layer of oil. The communication is illustrated with numerous woodcuts of the crystals.

Catha Edulis, Active Principles of. R. Stockman. (*Pharm. J.*, 1912 [4], **35**, 675, 676.) The leaves are used for chewing, or infused for a tea in Abyssinia, Arabia and Somaliland. The action is said to be stimulant and refreshing like that of tea or coffee. The leaves and twigs contain three alkaloids, *cathine*, *cathidine* and *cathinine*. Cathine is extracted by macerating the material with water acidified with H_2SO_4 or $HC_3H_5O_3$. The extract is made alkaline with Na_2CO_3 and shaken out with $CHCl_3$. The base thus obtained was converted into sulphate, which was purified by washing with $CHCl_3$ and EtOH. When pure, cathine sulphate forms pure white crystals. The residual leaves were made alkaline with Na_2CO_3 and macerated with Et_2O. On evaporating this solvent, a green resinous mass was obtained which was extracted with dilute HCl. The acid liquid was shaken out with Et_2O, then made alkaline and again shaken out with the same solvent. In this manner cathidine was obtained. The alkaline washings and filtrate from cathidine were shaken out with $CHCl_3$. On evaporating this the residue obtained was extracted with dilute H_2SO_4. When allowed to

evaporate spontaneously this leaves crystals of cathinine sulphate. Cathine sulphate forms small needle-shaped crystals, easily soluble in water and in dilute alcohol, insoluble in most organic solvents. The free base liberated therefrom forms acicular, very bitter, crystals. Cathidine is amorphous, insoluble in water, freely soluble in most organic solvents. It does not form crystalline salts. Cathinine sulphate crystallizes from water in rosettes of acicular crystals. It is readily soluble in water, affording a bitter solution, sparingly soluble in EtOH, insoluble in most organic solvents. The base liberated from this salt is only partly crystalline from $CHCl_3$, sparingly soluble in water, with a strong alkaline reaction. The leaves yield about 0·15 per cent. of cathidine and the twigs 0·12 per cent. Only about 0·05 per cent. of crystalline cathine could be isolated; but this is accompanied by much amorphous alkaloid having similar physiological and chemical reactions. This may amount to 0·65 or 0·75 per cent. Cathine appears to act on the frog somewhat like a mixture of morphine and caffeine. Cathinine has not the same depressant effect, but is more stimulant to the spinal cord. Cathidine is a muscle poison and a slight nervous stimulant. In man they all act as stimulants, chiefly on the cerebrum and spinal cord, and are excitant in large doses. Cathine alone at first causes drowsiness. As cathidine is insoluble in water, the physiological action of the beverage prepared by infusing the leaves must be due to the other bases. The physiological reactions of the amorphous alkaloid accompanying cathine is similar to, but less intense than, those of that base. (See also *Y.B.*, **1911,** 241, and *Gen. Index.*)

Caulophyllum Thalictroides, Constituents of the Rhizome and Roots of. F. B. Power and A. H. Salway. (*Proc. Chem. Soc.*, 1913, **29,** 292). A preliminary test showed the presence of an alkaloid, and a small amount of an enzyme was obtained, which slowly hydrolysed amygdalin.

An alcoholic extract of the ground material, when distilled in a current of steam, yielded a small amount of an essential oil. From the alcoholic extract the following definite compounds were isolated: *Methylcytisine*, $C_{12}H_{16}ON_2$ (m.p. 137°; α_D −221·6°), the picrate of which melts at 228°; a crystalline glucoside, *caulosaponin*, $C_{51}H_{88}O_{17},4H_2O$ (m.p. 250–255°), which on hydrolysis is resolved into *caulosapogenin*, $C_{42}H_{66}O_6$ (m.p. 315°), and dextrose; a new crystalline glucoside, *caulophyllo-*

saponin, $C_{66}H_{104}O_{17}$ (m.p. 250–260°; α_D + 32·3°), which on hydrolysis is resolved into *caulophyllosapogenin*, $C_{56}H_{88}O_9$ (m.p. 315°), and arabinose; a phytosterol, $C_{27}H_{46}O$ (m.p. 153°); citrullol, $C_{28}H_{45}O_2(OH)_3$; a mixture of fatty acids, consisting of palmitic, stearic, cerotic, oleic, and linolic acids. The alcoholic extract also contained a quantity of sugar, which yielded *d*-phenylglucosazone (m.p. 210°), and a comparatively small amount of resinous material.

Methylcytisine represents the alkaloid first isolated by J. U. Lloyd (*Proc. Amer. Pharm. Assoc.*, 1893, xli., 115), and designated by him "caulophylline," but its composition had not heretofore been known. The glucoside to which the name of *caulosaponin* has now been given is undoubtedly identical with a glucosidic substance, which was likewise first obtained by Lloyd, and termed "leontin," although its formula had not been correctly determined. Its complete characterization has now been effected.

Physiological experiments show that methylcytisine is very similar in its action to cytisine, but not nearly so potent, the latter being at least ten times as active as the former on the blood pressure of the cat. Also in other directions methylcytisine is very much weaker than cytisine.

The glucosides, caulosaponin and caulophyllosaponin, showed the behaviour of the class of substances known as saponins. Solutions of these substances in physiological salt solution, although very dilute, were found to be powerfully haemolytic for washed red blood corpuscles, and were also toxic for isolated, perfused frog's hearts. The administration of the two glucosides by the mouth to small cats, in doses of 0·1 Gm. each, resulted in no symptoms of physiological activity other than a mild purgative action after several hours.

Cluytia Similis, Constituents of. F. Tutin and H. W. B. Clewer. (*Proc. Chem. Soc.*, 1912, **28**, 265.) The plant has a local reputation in South Africa as a remedy for anthrax and for disinfecting anthrax-infected meat. The root is also eaten by the natives as a remedy for snakebite. The entire plant was examined and found to contain: *Cluytyl alcohol*, $C_{28}H_{58}O$, m.p. 82·5°C.; *cluytinic acid*, $C_{21}H_{42}O_2$, m.p. 69°C.; *cluytyl cluytinate*, $C_{49}H_{98}O_2$, m.p. 76·5°C.; *cluytiasterol*, $C_{27}H_{44}O$, m.p. 159°C.; a new acid, $C_{10}H_{10}O_4$, m.p. 159°C.; *cluytianol*, $C_{23}H_{37}O(OH)_3$, m.p. 300–305°C., isomeric with ipuranol. Its

triacetyl melts at 160°C. and its tribenzoyl at 192°C. Besides these, chrysophanol, fatty acids and other known compounds were present. The root contains a quantity of inorganic matter, in which Sr was present.

Cynanchum Caudatum, Toxic Principle of. K. Iwakawa, (*Arch. experiment. Path.*, **10,** 118; *Nouveaux Remèdes*, 1913, **30,** 215.) The dried root of this plant contains a colourless, amorphous, non-nitrogenous, toxic principle *cynanchotoxin*, m.p. 125–128°C., after softening at 116°C. It resembles picrotoxin in its action on the frog's heart. It causes violent convulsions in warm-blooded animals.

Dicoma Anomala, Chemical Examination of. F. Tutin and W. J. S. Naunton. (*Pharm. J.*, 1913 [4], **36,** 694.) The small plant, *Dicoma anomala*, Sond., belonging to the *Compositae*, is known in South Africa by the Kaffir name of *in-nyongwnea*. It is reputed to possess medicinal value for colic, but it is also used for a very singular purpose. If a Kaffir goes to a strange place, he chews a little of the root, in the belief that, if he then eat any poisoned food, he will immediately vomit it.

Dicoma anomala is plentiful at Main, in Tembuland, and on the stony hills in the midlands of Natal. Its leaves possess an intensely bitter taste.

No information has hitherto been obtained regarding the constituents of *Dicoma anomala*.

The material employed for the investigation consisted of the entire air-dried plant, which had been specially collected in South Africa.

An alcoholic extract of the plant, when distilled in a current of steam, yielded a small amount of an essential oil. The portion of the extract which was soluble in water yielded a small amount of a colourless crystalline glucoside, which appeared to possess the formula $C_{39}H_{58}O_{17}$, and a large amount of a yellow amorphous product, which, on hydrolysis with alkali, gave 3 : 4 dihydroxycinnamic acid. The aqueous liquid contained, furthermore, a quantity of sugar which yielded *d*-phenylglucosazone, melting at 218°.

The portion of the extract, which was insoluble in water, formed a dark-coloured, resinous mass. It consisted largely of amorphous products, some of which gave 3 : 4 dihydroxycinnamic acid on hydrolysis, and a small amount of an amorphous alkaloid was also present. The following definite sub-

stances were, however, obtained from the resin: (1) Hentriacontane, $C_{31}H_{64}$; (2) a phytosterol, $C_{28}H_{46}O$, which melts at 159°, and seems to be a lower homologue of stigmasterol; (3) palmitic, stearic, arachidic, cerotic, and melissic acids, together with some unsaturated acids which appeared to consist chiefly of a compound, $C_{16}H_{30}O_2$, such as has been obtained by Bull from cod-liver oil.

Erythrophlœum Guineense Bark, Examination of. F. B. Power and A. H. Salway. (*Amer. J. Pharm.*, 1912, **84**, 337.) The extremely poisonous bark is known under a number of names, as "Sassy bark," "mancona bark," "redwater tree bark," "casca bark," "doom bark" and "Nkasa bark."

A quantity of the bark was completely extracted with hot alcohol, and the resulting concentrated extract distilled in a current of steam, but it yielded no essential oil.

From the portion of the extract which was soluble in water the following substances were isolated: a very small amount of luteolin, $C_{15}H_{10}O_6$, and a small amount of an alkaloid which agreed in its characters and physiological action with erythrophleine, as described by Harnack (*Y.B.*, **1897**, 58).

Both the alkaloid and its salts were amorphous. The aqueous liquid contained, furthermore, a considerable quantity of tannin, and a sugar which yielded *d*-phenylglucosazone, melting at 210°C.

The portion of the alcoholic extract which was insoluble in water consisted of a dark brown, brittle resin, and represented 13·5 per cent. of the weight of the bark. From this product the following substances were obtained: a phytosterol, $C_{27}H_{46}O$ (m.p. 130–133°C.); cerotic, stearic, palmitic, oleic and linolic acids; and very small amounts of ipuranol, $C_{23}H_{38}O_2(OH)_2$, and luteolin, $C_{15}H_{10}O_6$. A portion of the latter compound was apparently contained in the resin in the form of a glucoside.

Inasmuch as the results of a preliminary test had indicated a much larger proportion of alkaloid to be contained in the bark than could subsequently be isolated, it appears probable that some change had taken place during the processes of extraction. This could not be more precisely determined on account of the very indefinite character of the base, which also precluded its further chemical study.

Since the bark is an exceedingly violent poison, and is largely used in West Africa for criminal purposes, it may be noted that the recognized and apparently most efficient antidote consists

in the prompt administration of an emetic, or use of the stomach-pump, with subsequent stimulant remedies.

Euphorbia Pilulifera, Chemical Examination of. F. B. Power and H. Browning, junr. (*Pharm J.*, 1913 [4], **36,** 506.) The material employed consisted of the entire plant, which had been specially collected for the purpose in the Fiji islands. The air-dried material (20·07 kilogrammes), when extracted with hot alcohol, and the resulting extract distilled in a current of steam, yielded a small amount (3·7 Gm.) of a pale yellow essential oil. From the portion of the alcoholic extract which was soluble in water, the following substances were isolated: (1) Gallic acid; (2) quercetin, $C_{15}H_{10}O_7$; (3) a new phenolic substance, $C_{28}H_{18}O_{15}$, occurring in clustered micro-needles decomposing at 340°C. The aqueous liquid contained, furthermore, a considerable quantity of amorphous glucosidic material, together with a laevorotatory sugar which yielded *d*-phenylglucosazone (m.p. 218–220°). There were also indications of the presence of an exceedingly small amount of alkaloidal substance, but this did not permit of being further characterized.

The portion of the alcoholic extract which was insoluble in water consisted of soft, resinous material, amounting to about 3·2 per cent. of the weight of the air-dried plant. From this material there were isolated: (1) Triacontane, $C_{30}H_{62}$, with apparently a little ceryl alcohol, $C_{27}H_{56}O$; (2) a new monohydric alcohol, *euphosterol*, $C_{25}H_{39}\cdot OH$, m.p. 274–275°, which yielded an acetyl derivative (m.p. 295–297°) and a bromoacetyl derivative (m.p. 183–186°). Euphosterol is evidently closely related to the compounds designated respectively as androsterol, homoandrosterol, taraxasterol and homotaraxasterol, all of which appear to be members of a series of monohydric alcohols represented by the general formula, $C_nH_{2n-10}O$. (3) A phytosterol (m.p. 132–133°); (4) a phytosterolin (phytosterol glucoside); (5) jambulol, $C_{16}H_3O_4(OH)_5$; (6) melissic acid, $C_{30}H_{60}O_2$, and a mixture of acids which appeared to consist chiefly of palmitic, oleic and linolic acids.

Among the various above-mentioned constituents of *Euphorbia pilulifera* there are none to which any specific physiological action may be ascribed. Such therapeutic virtues as the plant has been presumed to possess would therefore not appear to depend upon any single substance of a definite chemical character.

Formaldehyde, Presence of, in the Juices of Green Plants. F. Angelico and G. Catalano. (*Gazz. Chim. Ital.*, **43,** I, 38; *Chem. Abs. Amer. Chem. Soc.*, 1913, **7,** 1894.) By means of the glucoside active principle of *Atractylis gummifera*, HCHO has been detected in the juices of green plants of the most varied species. That its presence is really connected with the phenomena of the chlorophyll function, not with a subsequent activity of the vegetable protoplasm, is indicated by the fact that plants kept in the dark for 24 hours or certain species of fungi which do not contain chlorophyll gave absolutely negative tests for HCHO.

Formaldehyde, Presence of, in Leaves. T. Curtius and H. Franzen. (*Berichte*, 1912, **45,** 1715.) The authors find that beech leaves yield on distillation a minute quantity of formaldehyde equivalent to 0·0008613 Gm. per kilo. The leaves were distilled with steam. The acid distillate was made faintly alkaline with $Ba(OH)_2$ and concentrated by distillation. The aldehydes present in this second distillate were converted into acids by agitation with freshly precipitated AgO. The acids were then converted into Ba salts. In one case the salt formed was $Ba2(CHO_2)$. The fact that the aldehyde has been thus detected confirms Boeyer's theory that CO_2 is first of all reduced to CH_2O and that the latter, by condensation, forms carbohydrates.

Freesia Leichtlimona, Toxicity of. R. Dubois. (*Bull. Pharm. Lyon.*; *Répertoire*, 1913, **25,** 170.) An alcoholic extract of the fragrant flowers of *Freesia leichtlimona* injected in small doses into frogs and guinea-pigs kills them quickly. On dogs it acts as a diuretic and sialogogue, ultimately causing death. The alcoholic extract of the bulbs is also fatally poisonous, but is not so active as that of the flowers. The fresh crushed bulbs emit a peculiar odour, due to chemical reaction of some constituents. The nature of the toxic substance has not been determined.

Fungi, Higher, Chemical Constituents of. J. Zellner. (*Monats. f. Chem.*, 1913, **34,** 321; *Chem. Zentralb.*, 1913, **1,** 1611.) *Armillaria mellea.*—The petroleum ether extract yields an oil containing a considerable amount of lecithin. Its characters and constituents are described on detail. The ether extract contains ergosterins, but no cerebrin. The alcohol extract con-

tains mannitol, probably mycose, glucose, and probably choline. *Lactarius piperatus* contains fat, ergosterins, a substance allied to the purins; also lecithin and choline. The so-called lactarinic acid of others is probably identical with the stearic acid found by the author. In addition, resinous matter, mannitol, inositol, glucose and a little choline were isolated. *Phaliota squarrosa* contains lethicin, ergosterins and phlobaphene, mannitol, mycose, glucose and choline. *Polyporus betulinus* contains ergosterins and a cerebrin; a resin alcohol polyporol, $C_{31}H_{50}O_5$(?), a phlobophane; it contains only a very little mannitol; a carbohydrate allied to inulin or starch is present.

Fungi, Toxicity of Certain. W. W. Ford and J. L. Sherrick. (*J. Pharmacol.*, **4,** 321.) *Pholiota autumnalis* contains a powerful poison for both rabbits and guinea pigs. *Inocybe decipiens* contains a poison which belongs to the muscarine-pilocarpine series. *Agaricus amygdalinus*, Curtis, has no effect on red blood corpuscles, no action on the frog heart and is not toxic to rabbits or guinea pigs. No conclusions could be reached concerning *Amanita pantherina*. *A. mappa* (Batsch), Fries, is free from muscarine and closely resembles *A. phalloides* in its properties. *Gyromytra esculenta*, Fries, appears to be inert. *Entomola modestum*, Peck, and *E. subtruncatum*, Peck, contain no hemolysins and no agglutinins, and these as well as *Leptonia flavobrunnea*, Peck, and *Lepiota haemotosperma*, Peck, have no action on the frog heart and are not toxic to rabbits and guinea pigs upon subcutaneous injection.

Hops, Constituents of. F. B. Power, F. Tutin and H. Rogerson. (*Proc. Chem. Soc.*, 1913, **29,** 180.) The bitterness of hops is not due to any single substance, but is to be attributed to a number of products, which are mostly amorphous. Some of these products are soluble in water, whilst others represent constituents of the resin. One well-defined, new crystalline phenolic substance, which possesses a bitter taste, has now been isolated from the resin, and designated *humulol*, $C_{17}H_{18}O_4$; when crystallized from 50 per cent. acetic acid, it forms needles of a pale fawn colour, m.p. at 196°C. Another new crystalline compound, of nearly the same percentage composition as humulol, but which has an orange-yellow colour and is devoid of bitterness, has been designated *xanthohumol*. It appears to possess the formula $C_{13}H_{14}O_3$, m.p. 172°C.

The resin of hops contains a large proportion of fatty acids and their esters, a fact which does not seem to have previously been observed or considered. It follows that such of the proposed methods for the valuation of hops as are based on the titration of extracts obtained by means of light petroleum and similar solvents are of very doubtful utility.

Hops, Nitrogenous Constituents of. A. C. Chapman. (*Proc. Chem. Soc.*, 1913, **29,** 182.) The author publishes a preliminary note on the subject in consequence of the publication of the communication of Power, Tutin and Rogerson. He has already isolated certain crystalline bases, and the investigation is being continued. These were obtained by treating the aqueous extract of hops with basic lead acetate; the filtrate, after removing excess of Pb, was precipitated with phosphotungstic acid. The bases were liberated from this precipitate in the usual manner. Among them the following have been isolated: purine, asparagine, adenine, hyposanthine, betaine, choline; other nitrogenous substances have been found, but are not at present identified. A non-nitrogenous, crystalline substance, m.p. about 70° C., was also isolated and is being investigated. It is the "wax" alluded to in the literature of the subject. KNO_3 is present in the aqueous extract of some hops.

Hydrocyanic Acid, Occurrence of, in Certain Plants. M. Mirande. (*Comptes rend.*, 1912, **155,** 783, 925.) The author has found the following amount of HCN in 100 parts of fresh leaves: *Calycanthus floridus*, L., 0·004; *C. laevigata*, Willd., 0·004; *C. occidentallis*, Hook., 0·016; *Chimonanthus fragrans*, Lindl., 0·019. The composite, *Centaurea crocodylum*, and the Commelinaceous plant, *Tinantia fugax*, also yield traces of HCN. (See also *Y.B.*, **1906,** 69; **1907,** 80, 110; **1909,** 25, 42; **1910,** 114, 116; **1911,** 196.)

Ilex Opaca Fruit, Constituents of. F. F. Carhart and G. H. Miller. (*Chem. News*, 1913, **107,** 243.) The dull red fruits of the American holly are strongly purgative and emetic. The total sugars present amounted to 46·3 per cent., consisting of a mixture of fructose and glucose. Oxalic acid was found to be present. The berries after the extraction of the sugars gave 1·5 per cent. of fixed oil, resembling castor oil in its characters.

Leucothoe Grayana, Toxic Principle in.—Kubo. (*Archiv. Exp. Path. u. Pharmacol.*, 1912, **67,** 111; *Pharm. Zentralh.*,

1913, **54,** 199.) This ericaceous plant, indigenous to Northern Japan, is well known to be poisonous. The author has isolated from the leaves a toxic, crystalline substance, which is neither a glucoside nor an alkaloid. It forms white, sweetish-bitter, acrid needles; m.p. 222-223°C.; soluble in hot water, in EtOH and in $HC_2H_3O_2$; sparingly soluble in cold water and in hot $CHCl_3$; almost insoluble in Et_2O, in C_6H_6, in amyl alcohol, and in petroleum ether. It acts as an irritant poison on animals. The name *grayanotoxin* has been given to it. It contains no N and is not hydrolysed by boiling with mineral acids. It was obtained by purifying the hot water decoction, first with lead acetate, then with basic lead acetate; removing the Pb with H_2SO_4; evaporating to a syrup; treating this with EtOH; extracting the EtOH residue with water; removing coloured impurities by shaking out with cold $CHCl_3$ and finally slowly crystallizing from warm $CHCl_3$ at 50°C.

Oxalic Acid, Determination of, in Vegetable Tissues. A. Grégoire and E. Carpiaux. (*Annales de Chim. Analyt.*, 1913, **18,** 147.) About 5 Gm. of the material, previously rendered free from fat by means of Et_2O, is digested on the water-bath with 20 c.c. of HCl, 4 : 100, for an hour. A small quantity of anhydrous Na_2SO_4 is then added; and after cooling, 100 c.c. of EtOH 94 per cent. After setting aside, the precipitate is filtered out and washed with alcohol. The filtrate is treated with a slight excess of AmOH and the EtOH is evaporated off. The residue is re-dissolved in water acidified with HCl and evaporated almost to dryness; a few drops of H_2SO_4, 1 : 4, are added and enough anhydrous Na_2SO_4 to form a dry mass. This is extracted with 4 or 5 successive washings with Et_2O. The Et_2O solution is rendered faintly alkaline with AmOH and evaporated. The residue, taken up in water, is precipitated with $Ca2C_2H_3O_2$ in solution slightly acid with $HC_2H_3O_2$. The precipitate is collected, dried, calcined, and weighed as CaO. From this the equivalent of CaC_2O_4 is calculated.

Phaseolus Multiflorus Roots, Chemical Examination of. F. B. Power and A. H. Salway. (*Pharm. J.*, 1913 [4], **36,** 550.) The roots of the scarlet runner have been stated to be narcotic and poisonous. The authors are unable to detect any toxic substance in them in the dry condition.

The material used for the investigation consisted of the air-

dried roots, together with a small portion of the attached aerial stem, and was collected in the autumn from plants grown in Kent. Although the amount of this material available was but about 2 kilogrammes, the following constituents were isolated or identified: (1) An enzyme, which readily hydrolysed amygdalin; (2) a small amount of an essential oil; (3) furan-β-carboxylic acid, $C_5H_4O_3$ (m.p. 120°); (4) allantoin, $C_4H_6O_3N_4$; (5) a phytosterol, $C_{27}H_{46}O$ (m.p. 130°), and apparently a little pentatriacontane, $C_{35}H_{72}$; (6) a small amount of substance having the characters of a phytosterol glucoside (*Journ. Chem. Soc.*, 1913, **103,** 399); (7) a new crystalline glucoside, *phaseosaponin*, $C_{50}H_{84}O_{20}$ (m.p. 238°), which on hydrolysis was resolved into a substance, *phaseosapogenin*, $C_{26}H_{44}O_4$, and a sugar which appeared to be rhamnose; (8) a mixture of solid and liquid fatty acids, the latter being unsaturated. The roots also contained, besides some resin and amorphous glucosidic material, a quantity of sugar, which yielded *d*-phenylglucosazone (m.p. 212°). No alkaloid was present, nor could any trace of a compound capable of yielding HCN be detected.

Physiological tests, in conjunction with the chemical examination, have afforded no evidence that the roots of the scarlet runner bean possess the toxic properties ascribed to them. It is known that the seed of *Phaseolus lunatus*—the so-called Lima bean—as obtained from plants growing wild, contain the cyanogenetic glucoside phaseolunatin (*Y.B.*, **1904,** 140), which is not present in the seed of the cultivated plant, and a similar condition has been observed by H. E. Armstrong and his collaborators to exist in the case of the stems and leaves of the white clover, *Trifolium repens*, and by Mirande. Whether the scarlet runner bean in a wild state or cultivated in a tropical climate may produce roots which exhibit poisonous properties the authors are at present unable to determine.

Phytin and Phytic Acid. G. Clarke. (*Proc. Chem. Soc.*, 1913, **29,** 27). Phytin was extracted from finely ground oil-free seeds of the ordinary Indian field mustards, a mixture of *Brassica juncea* (Hf. and T.) and *Brassia campestris* (Linn.), by 4 per cent. acetic acid or 0·2 per cent. HCl, and separated from the dark brown acid extract by neutralization with ammonia. The crude substance was purified by further extraction, and precipitation from dilute acetic acid, and finally by extracting with ice-cold 8 per cent. acetic acid, from which it separated on boiling as an

amorphous white powder, completely re-dissolving if allowed to cool. The yield was 0·3 to 0·4 per cent. of the seeds. The phytin thus prepared resembled in properties the substance described by Schulze and Winterstein. It was completely soluble in cold, very sparingly so in hot, dilute acetic acid. It was decomposed by heating under pressure at 130–150° with 30 per cent. sulphuric acid into phosphoric acid and inositol (hexa-acetyl derivative, m.p. 211°). The free acid was obtained from the pure phytin described above by precipitating the lead salt from cold dilute acetic acid, decomposing the latter with H_2S, and repeating the treatment until the acid residue was completely soluble in 95 per cent. EtOH. This substance consisted of a mixture of approximately equal proportions of phosphoric acid and an acid corresponding with the formula $C_3H_4O(HPO_4)$.

The strychnine salt of the above acid, corresponding with the empirical formula, $C_{24}H_{27}O_7N_2P,2H_2O$ or $C_3H_4O(HPO_4)$, $C_{21}H_{22}O_2N_2,2H_2O$, crystallized from boiling water, in which it was sparingly soluble, in long needles melting and decomposing at 202–203°C. It was very easily separated in a pure condition from strychnine dihydrogen phosphate (m.p. 252–253°C.), with which it was mixed, by fractional crystallization from water, the latter salt being very readily soluble in the cold. (See also *Y.B.*, **1904,** 141.)

Phytosterols of Matricaria Chamomilla, Tilia Europea, Linaria Vulgaris and Verbascum Thapsus. T. Klobb. (*Annal. Chim. Phys.*, **24,** 410; *Pharm. Zentralh.*, 1913, **54,** 360.) *Matricaria chamomilla.*—By extraction of the flowers with petroleum ether, or with alcohol, two solid phytosterols were obtained melting between 120 and 131°C. The dry substance has the α_D $-29·3°$ and gives reactions of laevophytosterols. *Tilia europea.*—The phytosterol occurs in leaflets, m.p. 126°C.; α_D $-29·7°$. *Linaria vulgaris.*—The EtOH extract is treated with Et_2O, and the Et_2O extract is saponified. In this manner crystals, m.p. 138°C., giving laevophytosterol reactions are obtained. *Verbascum thapsus.*—The phytosterol from this plant crystallizes leaflets; m.p. 142–144°C.; α_D $-3°3'$. The reactions are somewhat different from other laevophytosterols and from cholesterol, so the distinctive name *verbasterol* is given to it. (See also *Y.B.*, **1910,** 103.)

Psoralea Corylifolia Seeds, Chemical Constituents of. (*South-*

all's Report, 1913, **21**, 18.) The ground seeds yielded 0·2 per cent. of volatile matter to steam distillation and shaking out the aqueous distillate with ether and petroleum ether. The extract from the earlier portions was oily, with a markedly heavy aromatic odour, showing a strong tendency to crystallize on standing; from the later fractions the extract was quite crystalline. The aqueous liquid gave a slight aldehyde reaction with Schiff's reagent.

Alcohol Extraction.—A portion of the ground seeds yielded 37·2 per cent. of a brown, thick extract containing obvious particles of resin to extraction with hot alcohol 94 per cent.

Petroleum Spirit Extraction.—The whole alcoholic extract was thoroughly washed with successive portions of petroleum spirit; on evaporation of the solvent a thick brownish oleoresin was obtained, amounting to 14·3 per cent. A direct extraction of the powder with petroleum spirit gave 13·7 per cent. The oleoresinous petroleum spirit extract was washed with alcohol (94 per cent.), which removed resinous matter, leaving a residue of 32·7 per cent. of fatty oil characters: Sp. gr., 0·9346; η_D 1·4775 at 20°; iodine value, 128·1 per cent.; saponification value, 190·3; unsaponifiable matter, 4·77 per cent.; fatty acids, 89·64 per cent.

The separated fatty acids were light yellow, crystalline and gave: M.p., 33·5°; equivalent, 280; iodine value, 127·0 per cent.

The high figure for unsaponifiable matter was possibly due to small quantities of resinous matter remaining. Traces of phytosterol were indicated on testing with acetic anhydride.

The resinoid matter after purification by precipitating the alcohol solution with water, and washing with petroleum ether, was separated into three resins by extraction successively with 1 per cent. (α) Am_2CO_3, (β) Na_2CO_3, (γ) NaOH. The ethereal solution after these extractions yielded on evaporation a brown semi-crystalline residue corresponding in odour and appearance with the crystalline matter extracted from the steam distillate.

The resins α, β and γ were all dark in colour, α and β resins could be entirely extracted from ethereal solution with $Ba(OH)_2$ solution, the γ variety, however, when so treated, yielded an insoluble Ba compound.

The semi-crystalline residue was purified and recrystallized from EtOH.

The pure substance was pale yellow in colour, m.p. 161°C.

soluble in Et_2O, $CHCl_3$, EtOH and glacial acetic acid, crystallizing well from the last two solvents, but slightly soluble in hot water. Boiled with Na_2CO_3 or NaOH it passed slowly into solution, being thrown down again on acidifying. Heated with CaO a phenolic odour was obtained. No nitrogen, halogens or sulphur were present and the substance was probably an anhydride or lactone. The aqueous washing from the alcohol extract gave indications of a small trace of an alkaloidal substance.

Sibucara Bark, Preliminary Examination of. (*Southall's Report*, 1913, **21,** 22.) The bark, a small quantity of which only was available, is known in Venezuela as "*Sibucara*." Its botanical source has not been traced. When masticated it produces a pronounced numbing and tingling of the tongue, with a marked sialogogue effect. Only a very minute trace of alkaloid was present. The hot alcoholic extract deposited a white amorphous substance on cooling, which was devoid of the characteristic taste of the original drug. This taste was found to be intensified in the remaining alcoholic solution, and this latter, when evaporated and extracted with ether, yielded a greenish, oily substance possessing the sialogogue and numbing effects in a marked degree. It is evident that the peculiar principle occurs in the Et_2O extract.

Symphocarpus Racemosus Fruits, Constituents of. C. B. Smith. (*Chem. News*, 1913, **107,** 266.) The fruit of the snowberry, a common horticultural shrub, contains no alkaloid. The dried berries yield 17·17 per cent. of sugars, probably a mixture of fructose and dextrose; 1·1 per cent. of oil; 3·68 per cent. of proteins; tartaric and citric acids, with a trace of malic acid. No alkaloid was detected.

Taraxacum Root, Constituents of. F. B. Power and H. Browning, junr. (*Transact. Chem. Soc.*, 1912, **101,** 2411.) The material employed consisted of the air-dried, fresh roots of taraxacum, collected in the autumn from plants grown in England. They were found to contain a very small amount of an enzyme, which slowly hydrolysed amygdalin. An alcoholic extract of the root, when distilled in a current of steam, yielded a small amount of a yellow essential oil. From the portion of the extract which was soluble in water, the following substances were isolated: (1) *p*-hydroxyphenylacetic acid, $C_8H_8O_3$ (m.p. 144–146°); (2) 3 : 4-dihydroxycinnamic acid, $C_9H_8O_4$ (m.p.

214–216°); (3) a small amount of choline, $C_5H_{15}O_2N$. The aqueous liquid contained, furthermore, a considerable quantity of a laevorotatory sugar, which appeared to consist chiefly, if not entirely, of laevulose, and yielded an osazone, melting at 204–206°C.

The portion of the alcoholic extract which was insoluble in water consisted of a soft, oily resin, which amounted to 1·8 per cent. of the weight of the root. From this material the following compounds were isolated: (1) a new monohydric alcohol, *taraxasterol*, $C_{29}H_{47}\cdot OH$ (m.p. 221–222°; α_D + 96·3°), which yielded an acetyl derivative (m.p. 251–252°; α_D + 122·2°), a monobromoacetyl derivative (m.p. 233–234°), and a benzoyl derivative (m.p. 232°); (2) a new monohydric alcohol, *homotaraxasterol*, $C_{25}H_{39}\cdot OH$ (m.p. 163–164°; α_D + 25·3°), which yielded an acetyl derivative (m.p. 219–220°; α_D + 28·1°), and a benzoyl derivative (m.p. 202°). The above-mentioned alcohols, together with two previously isolated compounds, androsterol, $C_{30}H_{49}\cdot OH$, and homoandrosterol, $C_{27}H_{43}\cdot OH$, constitute an homologous group, which is represented by the general formula $C_nH_{2n-10}O$. (3) Cluytianol, $C_{29}H_{46}O(OH)_4$, melting at 297° from which the tetra-acetyl and tetrabenzoyl derivatives were prepared; (4) palmitic, cerotic, and melissic acids, together with a mixture of unsaturated acids, consisting chiefly of oleic and linolic acids, with, apparently, a little linolenic acid.

The bitter taste of taraxacum, which has hitherto been ascribed to the so-called "taraxacin," appears to be due chiefly to dark-coloured, amorphous material, and not to any distinct principle. It was found, for example, that the portion of an alcoholic extract of the root which is soluble in water, when repeatedly extracted with warm amyl alcohol, yielded a viscous product, which possessed an intensely bitter taste.

A consideration of the results of the present investigation renders it evident that the products which many years ago received the designations of "taraxacin" and "taraxacerin" were not only indefinite in character, but must have consisted of very complex mixtures. It is therefore desirable that these names should no longer be retained in the literature.

Taxodium Distichum, Oil of the Cones of. A. F. Odell. (*J. Amer. Chem. Soc.*, 1912, **34**, 824.) The cones of the South cypress distilled in September yielded 1 per cent. of yellowish green oil with an odour of pinene; the cones which were collected

later gave 1·5 to 2 per cent. of darker oil, sp. gr. 0·86 and 0·850 ; α_D + 18·0 and + 35·5°, alcohol-content 2·5 per cent. The oil contained about 85 per cent. of dextro-α-pinene and 5 per cent. dextro-limonene, 2 per cent. of a dextrorotatory fraction which probably contains a pseudo-terpene alcohol, 3 per cent. carvone, as well as 3 per cent. of a dextrorotatory tricyclic sesquiterpene, probably identical with the sesquiterpene from the wood oil.

Theobroma Cacao Seeds, Fresh, Chemical Investigation of. L. Reutter. (*Comptes rend.*, 1913, **156,** 1842.) Enzymes were destroyed by exposing the fresh beans to steam at 110°C. The seeds were then deprived of fat and extracted with hot dilute MeOH. The reddish violet solution on spontaneous evaporation deposited rectangular white micro-crystals of *cacaorine*, $C_{16}H_{20}N_8O_6$, m.p. 184–185°C. ; soluble in water, the solution being optically inactive and neutral in reaction ; becoming brownish on exposure and pink when acidified on hydrolysis, theobromine, and a reddish brown insoluble decomposition product were formed. The reddish violet mother liquor, from which cacaorine had crystallized, gave bright reddish violet scales of *cacao red*, $C_{40}H_{60}NO_{27}$, when evaporated *in vacuo*. This gives a blood red powder, slowly oxidized and turning brown. Soluble in water to a faintly acid, optically inactive solution, giving a yellow brown with alkalies and a bright red with acids ; affording a number of colour reactions and precipitates. The aqueous solutions reduce Fehling's reagent and precipitate with gelatin. On hydrolysis an amorphous brown substance, *cacao brown*, $C_{76}H_{78}NO_{34}$, a dextrorotatory sugar and CO_2 are formed.

MATERIA MEDICA

NEW REMEDIES

Compiled by F. W. Gamble

Where no reference is given to current literature, the information is usually derived from the maker's publications.

Acitrin (*Amer. Drug.*, 1913, **61,** 12) is a yellowish, odourless, tasteless powder; sparingly soluble in water; recommended for the treatment of gout and nerve pains. The dose is 7½ grains four times a day; this may be increased to 15 grains three times daily.

Adrenine applied locally for Carcinoma. Peel Ritchie. (*Lancet*, 1912, **1,** 1754.) Adrenine was applied locally to a skin carcinoma of the cheek to assist penetration of radium rays by rendering the part anaemic. The 1 in 1,000 solution was painted over the growth, or a few minims were injected into the tumour. A distinct change for the better was noted, which was attributed to the adrenine; the improvement continued when the radiation was discontinued. The ulcer finally healed completely, and there has been no indication of recurrence after six years.

Aleudrine. (*Union Pharm.*, 1912, **53,** 468.) Aleudrine is the carbamic ether of dichloroisopropylic alcohol; a white, odourless, crystalline powder; soluble in Et_2O, EtOH, glycerin and oils, but only slightly soluble in water. The aqueous solution decomposes on boiling. In doses of 7½ grains, it is calmative; in 15 grain doses, hypnotic and sedative.

Allantoin as a Cell Proliferant. C. J. Macalister. (*B.M.J.*, 1912, **2,** 703.) Allantoin has been shown to be a general cell proliferant; it influences the reproduction of normal animal cells as well as of malignant cells. It is also a vegetable cell

proliferant; experiments are described which demonstrate its effect upon the growth of bulbs. When added in solution it inhibits growth and root formation; when injected into the bulbs, growth is stimulated. Allantoin, when given in milk to children suffering from rickets and wasting, is stated to promote growth and nutrition. Mixtures of allantoin with metaphosphoric acid have been used for the treatment of tuberculous sinuses and skin infections, to increase cell resistance, and to promote healing. This treatment is based on the idea that allantoin may be an agent which has to do with the activities of nucleic acid, since the latter contains analogous purin groups as well as metaphosphoric acid groups.

Ammonium Uranate. (*Pharm. J.*, 1913 [4], **36,** 563.) This salt has been recommended for use for syphilis, and is especially valuable for iritis and double neuritis. The drug is administered by hypodermic or intramuscular injection, in doses of 1 c.c. of a 5 per cent. suspension in liquid paraffin, injected at intervals of a few days until 6 or 8 c.c. have been given.

Amphotropin is hexamethylene-tetramine camphorate, used as a urinary antiseptic; a white, crystalline powder, soluble in 10 parts of water, with an acid reaction; soluble also in EtOH and $CHCl_3$. The usual dose is 7½ grains three times daily; this may be increased to 15 grains thrice daily. The drug is well tolerated; alkaline urine becomes acid or neutral, and decomposition is prevented.

Antimony in Fine Powder for Medicinal Use. (*Pharm. J.*, 1912, **35,** 793.) The Sb is precipitated in a finely divided state, from a solution of a soluble salt, such as $SbCl_3$ by means of Zn in presence of HCl or other free acid. When the Zn is completely dissolved, the Sb is filtered off and washed with the aqueous solution of an organic acid such as tartaric acid until free from Cl, and then with water till free from acid. The precipitate thus obtained is pure Sb in a finely divided state. It is used therapeutically by intramuscular, intravenous, and endodermic injections.

Antodyne. This is phenoxy-propanediol; white needles, very soluble in water. Used as an analgesic for neuralgia and rheumatism; it is slightly toxic, and not antipyretic. Dose: 15 to 60 grains in 24 hours in single doses of 7½ grains.

Arsenometaferrin is a metaferrin derivative containing 0·1 per cent. of As_2O_3 in organic combination. Prepared in tablets of 4 grains each, equivalent to 0·004 grain of arsenic. Dose : 1 tablet, increased to 2.

Aspirin, Soluble (*Apoth. Zeit.*, 1912, **27,** 518). is calcium acetyl-salicylate ; a white powder, soluble in water. Solutions are almost tasteless and decompose on keeping with formation of acetic acid. It is incompatible with acids. The dose is $7\frac{1}{2}$ to 15 grains.

Azodolen. (*Apoth. Zeit.*, 1912, **27,** 466 ; *Pharm. J.*, 35 [4], 402.) A mixture of equal parts of pellidol and of iodolen. (Iodolen is a compound of iodol with albumin.) The result is a powder with very marked antiseptic and healing properties.

Baissade's Balsam for Eczema. (*B.M.J. Epit.*, 1912, **2,** 44.) Alexander gives the following formula of Baissade's "Baume," which is stated to be mild and exceedingly valuable for subacute and obstinate forms of eczema : Ol. lithanthracis, 18·0 ; Ol. cad., 15·0 ; resorcini, 2·0 ; mentholi, 5·0 ; guaiacoli, 5·0 ; camphorae, 40·0 ; sulphuris, 15·0 ; boracis, 36·0 ; glycerini, 54·0 ; acetoni, 80·0 ; Ol. ricini, 40·0 ; lanolini, 100·0. The sulphur, which must be precipitated out of turpentine oil, is mixed with the tar oil, and the lanoline at between 125° and 130°C. in a closed vessel. The borax must be dissolved in the glycerin before it is mixed with the other constituents.

Behring's Prophylactic against Diphtheria. (*Lancet*, 1913, **184,** 1626.) This is a mixture of diphtheria toxin with antitoxin, employed to immunize contacts and so prevent the spread of infection. The preparation is still in an experimental stage, but Behring will supply a quantity to hospital physicians under certain conditions.

Benedict's Test for Sugar in Urine. (*B.M.J.*, 1912, **2,** 1648.) A. R. Benedict recommended in 1911 the following solution in the place of Fehling's solution on the ground that the action is more sensitive and the solution keeps indefinitely : $CuSO_4.6H_2O$, 18 Gm. ; $Na_2CO_3 \cdot 10H_2O$, 200 Gm. ; $Na_3C_6H_5O_7$, 200 Gm. ; KCNS, 125 Gm. ; 5 per cent. K_4FeCy_6, 5 c.c. ; water to 1 litre. The test is carried out as with Fehling's solution, the end point being the disappearance of the blue colour. 25

c.c. of the solution is reduced by 0·05 Gm. of dextrose and by 0·053 of laevulose.

Benzol for Leukaemia. (*Lancet*, 1912, **183,** 250.) Von Korányi has been led by the known effects of benzol upon the blood to try its action in leukaemia. Three Gm. was given daily for a month, and afterwards 4 Gm. During the treatment the white blood corpuscles were reduced in number from 200,000 per cubic millimetre to 8,000. The number of red corpuscles fell at first to 3,000,000, but afterwards increased to 4,000,000. The spleen diminished in volume, and the general condition of the patient improved.

Besredka's Vaccines. (*Lancet*, 1913, **184,** 1155.) These vaccines are prepared by Besredka's method of incubating living cultures with their specific anti-serum; the toxic properties of the organisms are modified by this process of senitization in that when injected into the patient the living organisms undergo rapid destruction. The microbic endotoxins thus liberated stimulate the formation in the subcutaneous tissues of the specific anti-bodies which it is the object of vaccination to produce. The method has been applied to the preparation of typhoid, streptococcic, staphylococcic and gonococcic vaccines.

Brain Extract in the Treatment of Various Forms of Insanity. (*B.M.J.*, 1912, **2,** 1451; 1913, **1,** 204.) Maule Smith has prepared an extract from the brains of sheep and cattle by boiling the finely divided brain tissue in a mixture of EtOH and Et_2O, and straining through fine muslin. When cold, the supernatant fluid is decanted from the thick heavy deposit. This deposit is then carefully poured into boiling normal saline solution to which glycerin has been added; 30 c.c. of deposit added to 1,000 c.c. of saline solution forms an opalescent emulsion with practically no deposit. The brain tissue must be fresh and that from young animals is preferable. The preparation is rich in cholesterol and appears to be more active than the dried brain tissue preparations. The dose of the extract is two to four teaspoonfuls, by the mouth, three times a day.

Calcium and Gelatin, Injections of. (*Practitioner*, **90,** 902.) Müller and Saxl, to avoid the necrotic action of $CaCl_2$ given hypodermically, combine it with gelatin. From 5 to 7 c.c. of a solution containing 5 per cent. of $CaCl_2$ and 10 per cent.

of gelatine are warmed for 10 minutes in a water-bath, then cooled short of coagulation and injected into the gluteal region. There may be pain for some hours, also some infiltration and redness, but never any formation of an abscess or slough.

Calcium Salts, for Bronchial Asthma. (*Practitioner*, **89,** 429.) Kayser used $CaCl_2$ in fifteen asthmatic cases with thirteen successes and two failures. After three or four days, attacks became less frequent, and sometimes did not recur for several months; doses should be given regularly for eight days: 12½ grains every two hours, or 60 grains daily.

Calcium Salts for Hay Fever. (*Muench. Med. Woch.*, 1912, 352, through *Pharm. J.*) Patients subject to hay fever are given doses of about 7½ grains each of calcium chloride or calcium lactate three times daily, commencing a week before the grasses bloom. This dose is doubled if any symptoms of hay fever appear, and continued for about ten days.

Camphor for Subcutaneous or Intravenous Injection. (*Pharm. J.*, 1913 [4], **36.**) Camphor water is preferable to camphorated oil for hypodermic injection. The solubility of camphor in cold water or Ringer's solution is about 1 in 500, less soluble in warm water. The solution should be sterilized in closed vessels; it may become turbid when warmed.

Cane Sugar, West Indian, for Heart Failure. (*B.M.J.*, 1912, **2,** 693.) A. Goulston has previously referred to the action of cane sugar on the failing myocardium, since when other workers have confirmed its beneficial effects in certain forms of heart disease. The question is discussed as to whether the nutritional effect upon the myocardium depends on the dextrose only or whether it is due to some specific substance. Beet sugar is not found to have the same effect, and patients changing from cane to beet sugar were found to relapse.

Carbenzyme. (*B.M.J. Epit.*, 1913, **1,** 68.) A. Sticker and S. Rubaschow have investigated the action of this preparation, which contains pancreatic ferment absorbed by carbon. It is found to be less influenced by EtOH, $CHCl_3$ and $KMnO_4$ than other trypsin preparations; it does not attack normal tissue, except fat, and digests dead but decomposing tissues, and the contents of cysts. Clinically, its influence is beneficial on cold abscesses, tuberculosis of the soft parts, and softened lym-

phatic glands. Carbenzyme is put up in sterile ampullae, each containing 0·25 Gm.

Carbolic Solution for Exterminating Pediculi Capitis. A. Whitfield. (*Lancet*, 1912, **2**, 1648.) A 1 in 40 solution of phenol destroys pediculi and their ova absolutely, if applied according to the author's directions, which are devised to secure thorough saturation of the whole of the hair for ten minutes by the clock. At the end of this time the hair is allowed to drain and is swathed in a thick towel in the form of a turban, and allowed to remain so for an hour before washing out the carbolic acid, or simply drying.

Carotidin and the Carotid Body. (*B.M.J.*, 1913, **1**, 1074.) The carotid body is present in all mammals as well as in many other animals. In man it is a small ovoid body situated most commonly on the inner side of the common carotid artery close to the bifurcation. It is of highly vascular structure, freely innervated, and is obviously not a functionless organ. Frugani has recently re-investigated its physiological action by the extract-injection method. He prepared an extract called carotidin from the carotid bodies of young calves, so that 4 c.c. of extract represented one carotid body. He found that 4 to 6 c.c. injected intravenously were usually fatal to rabbits, but by giving small doses tolerance could readily be set up. The injections cause moderate vascular hypertension, followed by a considerable and prolonged fall of pressure. Frugani concluded that the carotid body probably possessed a true internal secretion.

Chavosote. (*Apoth. Zeit.*, 1912, **27**, 379.) This is a new germicide, recommended in dental practice. It is the methyl ether of estragol, or p-allyl-phenol $C_6H_4 \cdot OH \cdot C_3H_5$. It is an aromatic liquid, solidifying at 15°C. and boiling at 229°C.

Chlorocresol. (*Amer. Drug.*, 1913, **61**, 12.) These are tablets containing sodium compounds of parachlormetacresol. A half-per-cent. solution is used as a disinfectant; it is powerfully bactericidal and only slightly toxic.

Choline for Inoperable Cancer. (*B.M.J.*, 1913, **1**, 681.) Werner has described the dosage of choline employed. He prefers the borate of the base, which is given intravenously, at first 2 to 3 c.c. of a 10 per cent. solution diluted to 20 c.c.; later

the dose is raised to 2 to 5 c.c. For injection into the tumour or into the gluteal muscles undiluted 10 per cent. solution is used in doses of 2 to 5 c.c. Usually 4 or 5 injections are given each week. For the best results, 8 Gm. of choline require to be used. Under the treatment, the tumours are stated to soften and become fluid. It has not in any case been proved that cancer can be cured by these means.

Cod-Liver Oil and its Action in Phthisis. O. T. Williams. (*B.M.J.*, 1912, **2**, 700.) The author arrives at the following conclusions: (1) Clinical evidence shows that cod-liver oil has beneficial effects in phthisis. (2) It has marked action on fat absorption and nitrogen retention. (3) It is possible that the fatty acids of the oil, when they reach the tissues, have direct influence on the tubercle bacillus. (4) Of the oils on the market, the forms which are prepared under conditions which prevent oxidation have the greater amount of unsaturated fatty acid compounds to which the therapeutic effects can be attributed. (5) The oils prepared under these conditions have the least taste.

Experiments tend to show that unsaturated fatty acids inhibit the growth of the tubercle bacillus *in vitro*. Phosphorus is present only in the smallest amounts and iodine only in those oils where decomposition of the liver had occurred. When prepared in an atmosphere of CO_2 it consists almost entirely of unsaturated fats.

Contratoxin. This preparation, introduced by Mehnarto, and known sometimes as Contratoxin No. 4, is described as composed of various animal plasmas mixed in such definite proportion as to produce a lytic action on tubercle bacilli, staphylococci and streptococci. It is entirely free from antitoxins and is non-injurious to the patient. Contratoxin No. 4 is indicated in pulmonary tuberculosis of all types, also in acne scrofulosorum and scrofuloderma. Sold in boxes containing ten 10 c.c. ampoules; the first dose is 5 c.c. injected subcutaneously. This may produce a rise of temperature and some other symptoms; 4 or 5 days after the first dose, a second is given, which may be 5 or 10 c.c., according to the amount of reaction following the first dose. After a few injections the sputum shows marked phagocytosis, and the tubercle bacillus loses its acid-fastness. For children and young persons the dose is 1 to 2 c.c.

Copper Salts for Tuberculosis. (*Prov. Med.*, through *B.M.J. Epit.*, 1913, **1,** 95.) All the various manifestations of tuberculosis are amenable to treatment by Cu salts and yield more or less rapidly when this is begun early. For hypodermic injection, the acetate and colloidal phosphate are used; internally, $\frac{1}{6}$ grain doses of the acetate are given in the form of a pill.

Crotalin. (*Merck's Report*, 1912, 206.) This name is applied to a solution containing rattle-snake venom, which has been used for epilepsy. A weekly subcutaneous injection of $\frac{1}{200}$ grain is given at first, increasing to $\frac{1}{50}$ grain. Some local irritation and pain may result from the injections. With proper precautions, the effect is described as surprisingly good, but the substance must not be regarded as harmless.

Cuprase, Colloidal Copper. de Gers. (*Med. Press*, 1912, **2,** 6.) Colloidal copper is used by subcutaneous injection to produce "decancerization"—that is, to procure the disappearance of all cancerous manifestations. The preparation employed is described as a colloid of protoxyde of hydrated copper obtained chemically by reduction of salts of copper in presence of albumosic acid. The solution should be preserved in ampoules of yellow glass and away from light; they contain 5 Gm. in each equivalent to 0·00121 Gm. of pure copper. The colloid is not toxic and can be injected either under the skin or into the muscles. The injections are painless and no reaction follows; they are given every four days at first, the frequency afterwards varying according to the susceptibility of the patient. They may be repeated every two days, but no two injections should be made in the same place. Of 14 cases of cancer treated, four are said to have been completely cured, six are on the road to recovery, while the remaining four have been much improved.

Cystopurin is a double salt of hexamethylene tetramine and sodium acetate, recommended for bacterial affections of the urinary tract and as a diuretic; stated to exercise a sedative action in bacteriuria. Prepared in tablets of 1 Gm. containing 5 grains of hexamethylene tetramine; these are readily soluble in water, the solution having a slightly saline taste. The dose is usually two tablets three times a day.

Dextrose for Rectal Feeding. (*B.M.J.*, 1913, **1,** 111.) Mutch and Ryffel discuss the metabolic utility of rectal feeding. Their

experiments showed that 50 per cent. of the protein of peptonized milk may be absorbed from the colon, but it seems likely that bacterial decomposition must take place before protein can be absorbed in this way, and it is doubtful whether rectal feeding with protein is desirable. In the case of dextrose 99 per cent. is absorbed; a 6 per cent. solution in tap water, which is isotonic with blood,[1] is recommended. Fifteen fluid ounces or more of this solution, four times a day, is frequently well retained by an adult if the rectum is thoroughly washed out once a day with saline solution. The dextrose solution is more efficient as a source of water that saline solution. Dextrose given by the rectum has less influence upon acidosis and the formation of acetone bodies than when given by mouth.

Digitalysatum (**Bürger**). This solution is obtained by dialysis from the freshly expressed juice of digitalis leaves. Stated to contain all the active principles of digitalis leaves, and to have no toxic cumulative effects; physiologically standardized so that 1 c.c. is equivalent to $3\frac{1}{3}$ grains of dry or 15 grains of fresh leaves. Supplied in solution for use by the mouth and in ampoules each containing 2 c.c. for intravenous injection. The oral dose is 10 to 25 drops, three times a day.

Doriform (*Med. Press.*, 1913, **146,** 74) is a new antiseptic iodoform substitute in the form of an odourless, insoluble, yellow powder, described as a combination of Bi_2O_3 with tetra-bromo-pyrocatechin. It evidently therefore resembles noviform. A 5 to 10 per cent. ointment is applied to ulcers; a dusting powder (1 in 8) made with starch and ZnO is useful for erythematous conditions of the skin.

Elarsone (*J. Pharm. Chim.*, 1913, **7,** 305) is strontium chloro-arseno-behenolate, an amorphous, white powder, insoluble in water and other solvents, containing 13 per cent. of arsenic. It is of a fatty nature, and is a member of a new class of compound arsenical lipoids, put into commerce in the form of tablets, each corresponding to 0·005 Gm. of arsenic; the dose being one or two tablets according to age.

Elbon. (*Répert. Pharm.*, 1912, 24 [3], 537.) This is cinnamo benzoyloxyphenylurea, a white, tasteless and odourless powder, insoluble in water, alkalies or dilute acids, soluble in alcohol,

[1] Bennett and Gamble found that a 5·1 w/v solution of pure dextrose in distilled water was isotonic with blood serum.—*Y.B.*, **1912, 275.**

acetone and fixed oils. It is absorbed unchanged, and is then oxidized to benzoic acid and a cinnamic compound of para-aminophenol. It acts as an antipyretic, the effect being produced slowly and progressively. Specially recommended in phthisis. The dose is 45 to 60 grains daily, which may be increased to 75 or 90 grains.

Emetine by the Mouth for Amoebic Dysentery. (*B.M.J.*, 1913, **1,** 1369.) Keratin-coated tablets of emetine, ½ grain in each, were found satisfactory given by the mouth; they caused no sickness, and amelioration of the symptoms was rapid. Rest in bed after taking the dose is advised.

Emetine Hydrochloride for Dysentery. (*Lancet*, 1912, **183,** 1062; 1913, **184,** 1546.) Continued success with emetine by hypodermic injection in dysentery is reported. Rogers now gives doses of ½ grain or more once or twice daily. Cases of amoebic abscess of liver and dysenteric abscess opening into bronchi, successfully treated with emetine, are described.

Ervasine.—Rautenberg. (*Apoth. Zeit.*, 1912, **28,** 291.) Ervasine is acetylcresotinic acid, a higher homologue of acetylsalicylic acid; insoluble in water, soluble in organic solvents. Sent into commerce in tablets of 7½ grains. Its action is stated to be equal to that of aspirin; it does not, however, cause stomach pains or renal inflammation, even in large daily doses.

Ether Anæsthesia by Intratracheal Insufflation. R. E. Kelly. (*B.M.J.*, 1912, **2,** 112.) Meltzer and Aver have shown that if air is forced under pressure through a tube passed through the glottis without entirely occluding it, life can be maintained without respiratory movements. A catheter about half the size of the glottis is passed down the trachea until it reaches the bifurcation. The catheter is connected with a forced draught of air from 10 to 40 mm. of mercury pressure, the air having previously been warmed, moistened and etherized. The excess of air escapes between the catheter and the glottis. This method of producing anæsthesia, invented primarily for thoracic operations, possesses many advantages which promise to bring it into wide use. The apparatus is complicated, but is already in process of simplification.

Faivre's Cachets. C. Mannich and L. Schwedes (*Apoth. Zeit.*, 1912, **27,** 342) have examined these proprietary

cachets and state their composition to be approximately: phenacetin, 0·3; caffeine, 0·1; pyramidon, 0·15; quinine sulphate, 0·135; calcined magnesia, 0·04, for one cachet.

Fermentin. (*Practitioner*, August, 1912, 296,) Fermentin is a dry, yellowish white powder, of microscopic fineness, containing the protoplasmic and nuclear portions of yeast. It smells slightly of yeast, easily adheres to the skin, and mixes well with powders. It has reducing properties, is slightly antiseptic, and is chiefly indicated for acne folliculitis, seborrhoea oleosa, and especially for the small follicles occurring after shaving. A number of preparations are described.

Friedmann's Tuberculin. (*See* **Turtle Tuberculin.**)

Galyl or 1116. (*Paris Clinique et Ther.*, Feb. 5, 1913.) This substance is tetraoxydiphosphaminodiarsenobenzene. It is employed similarly to salvarsan, and contains 35·3 per cent. of arsenic, with 7·2 per cent. of phosphorus. A yellowish powder, insoluble in water and in alcohol, soluble in Na_2CO_3 solution, yielding a yellow or yellowish brown liquid, which retains its properties without alteration for several months if stored in completely filled sealed tubes. The alkali salt is precipitated from this solution by C_2H_5HO or NaCl. For intravenous injection, each centigramme of drug is dissolved in 3 c.c. of "carbonated serum" consisting of 12 Gm. of pure dry Na_2CO_3 in 1,000 Gm. of distilled water. A suspension in olive oil is used for intramuscular injection. The total therapeutic dose is for men 1·5 Gm., for women 1·2 to 1·5 Gm., divided into three injections given at intervals of eight days.

Glandular Extracts, Combined. (*N.Y. Med, Journ.*, 1912, 2, 7.) Starkey uses combined pituitary, ovarian and testicular extracts to counteract the undesirable effects sometimes produced by thyroid preparations. Pituitary gland, 1 part, thyroid (including parathyroid), 2 parts, ovary and testis, of each 10 parts, are mixed and reduced to a fine paste and allowed to macerate in an equal bulk of pure glycerin for 48 hours. The filtered product is injected intramuscularly in doses of about 15 minims.

Grotan is a trade name for tablets of sodium para-chloro-meta-cresol, for use as an antiseptic.

Hediosit is a carbohydrate ($C_7H_{12}O_7$), which is stated to be the lactone or anhydride of glucoheptonic acid. It is com-

pl tely oxidized in the body, even by diabetic patients, and is recommended as a nutritive sugar substitute. The taste is pleasant and sweetish, the reaction acid. The substance does not reduce Fehling's solution. It is stated to diminish glycosuria; its calorific value is equal to that of glucose.

Hexal. (*Pharm. Zeit.*, 1912, **58,** 742.) This is hexamethylenetetramine sulphosalicylate, and is used as a sedative urinary antiseptic. A white, crystalline substance, easily soluble in water. The solution precipitates albumin. Supplied in powder and in tablets of 0·5 Gm.; the dose is 0·5 to 1·0 Gm. dissolved in water three to six times daily, immediately after meals. Hexal contains 60·9 per cent. of sulpho-salicylic acid, and 39·1 per cent. of hexamethylenetetramine.

Hirudin in Eclampsia. (*Lancet*, 1912, **183,** 1575.) Fourteen severe cases of eclampsia treated by intravenous injections of 0·2 to 0·3 Gm. of hirudin, dissolved in at least 50 c.c. of Ringer's solution. Engelmann was favourably impressed with the results of the treatment, which is, however, only on trial.

Hypophysin. (*Pharm. J.*, 1913 [4], **36,** 514, 563.) This is the active principle of the hypophysis in the form of a crystalline salt, readily soluble in water. By the patented process of manufacture, an extract of hypophysis, free from albumin, is acidified with H_2SO_4, and phosphotungstic acid added until there is no further precipitate; the precipitate is collected, washed with water containing H_2SO_4 and afterwards decomposed with $Ba(HO)_2$; barium phosphotungstate is filtered off, residual barium removed as sulphate and the filtrate evaporated to crystallization. The commercial preparation is a 1 in 1,000 solution of the sulphates of the mixed bases, and is stated to possess all the physiological activity of the hypophysis.

Inulin in the Treatment of Diabetes. (*Med. Press.*, 1913, **147,** 17.) Strauss, following Külz, has employed this polysaccharide of laevulose. The patient was dieted to remove sugar to the greatest degree, and 100 Gm. daily of inulin then added to the diet in use. The inulin was well borne, there was diminished excretion of sugar and any acidosis present almost always disappeared.

Iodine as a Dressing for Operation Wounds. (*B.M.J.*, 1912, **2,** 765.) Madden, following Alcock, has used a 2 per cent. solution

of iodine as the sole dressing for operation wounds. After the operation is completed the wound and surroundings are painted with the iodine, and a piece of dressing thrown over it; afterwards, with a cradle supporting the bedclothes, the wound was left uncovered. Painting was repeated twice a day for the first four days, then once daily for a week. Fifty cases were treated with good results. Dalton uses the same solution as the sole dressing; he had excellent results in 77 cases. The wound was painted after insertion of stitches, again on the second day, and finally on the ninth day, after removal of stitches.

Ridgway (*B.M.J.*, 1913, **1,** 1159) regards iodine as the best antiseptic for use in tropical countries; compound fractures and other injuries were dressed with the 2 per cent. solution and covered with lint and a bandage.

Iodine for Typhoid Fever. (*Lancet*, 1913, **184,** 1346; *B.M.J.*, 1913, **1,** 117.) Walsh and Perez refer again to this treatment and say that its great success warrants trial on a large scale in fever hospitals. Walsh describes his method of treatment; he adds two or three drops of a mixture of tincture of iodine and carbolic acid in equal parts to a tumblerful of water, which stands by the bedside and is taken freely by the patient. Under this treatment the fever was cut short and robbed of its dangers, normal convalescence ensuing.

Iodine for Whooping Cough. (*Practitioner*, 89, 431.) Cavazzani has found iodine serviceable in the treatment of whooping cough. It reduces the intensity of symptoms, increases the interval between paroxysms, shortens the duration of disease and wards off complications. He recommends: iodi, gr. xv; potass. iodid, ʒjss; aq. destill, ℥jss. Dose: Infants, 4 to 6 drops; children of 2 to 5 years, 5 to 10 drops; above this age, 10 to 15 drops. (The amount of KI is given incorrectly in the article quoted as ℥jss.)

Iodoform by Intravenous Injection for Whooping Cough. (*B.M.J.*, 1912, **2,** 681.) Dewar describes this method. He gives 1 grain of iodoform dissolved in 10 minims of methylated ether, 0·720, repeating the dose daily, for a boy of 15. The treatment is recommended for adolescents and adults; in some cases 2½ to 40 per cent. of liquid paraffin is added to the dose, but this increases the coughing after the injection. The addition

of liquid paraffin prevents choking of the needle and makes the syringe work better.

Iodoform for Tuberculosis.—Crofton. (*Med. Press*, 1913, **146,** 9.) Intravenous injections of ½ grain CHI_3 in 2 minims of liquid paraffin and 5 minims pure ether; technique described. Cases in classes 1 and 2 take an injection every second day, increasing to 5 doses a week; in class 3 cases, ¼ grain doses are given at longer intervals. When injections cannot be given, doses of 6 to 10 grains CHI_3 daily, given by the mouth.

Iodometaferrin is an iodine derivative of metaferrin containing 7·5 per cent. of I in organic combination, 7·5 per cent. of Fe and 8 per cent. of P_2O_5. Prepared in the same manner and taken in the same doses as metaferrin.

Iron Salicylate. (*Practitioner*, **90,** 633.) Lawrance uses a solution containing in each adult dose, 7½ grains each of sodium salicylate and potassium bicarbonate with 7½ minims of solution of perchloride of iron. This combination has a well-marked diaphoretic action and is a non-depressing febrifuge; it has a most remarkable action in acute tonsillitis and erysipelas.

Isatophan (*J. Pharm. Chim.* [7] **6,** 122) is orthomethoxyatophan.

Istizin (*Apoth. Zeit.*, 1913, **28,** 339) is 1·8-dioxyanthraquinone, which is prepared synthetically for use as an aperient. Prepared in divisible tablets containing 0·3 Gm. in each; the dose is from 2½ to 7 grains. Taken at night the dose acts in 10 to 14 hours.

Kresatin. (*Amer. Drug.*, 1912, **60,** 437.) Kresatin is described as meta-cresyl acetate, a colourless oily fluid with a characteristic odour. Soluble in organic solvents, insoluble in water; with liquid paraffin or oils it forms a clear solution. Used on mucous membranes either pure or diluted with some oil.

Lactobacilline Glycogen. This very unsuitable name is given to tablets containing Metchnikoff's lactic bacillus, together with the sporulating amylolytic ferment *Bacillus glycobacter*. The latter organism has been the subject of clinical investigation by Metchnikoff; he finds that it converts amylaceous substances into sugars in the intestine and recommends that it be used

with the lactic bacillus to provide the most favourable conditions for the growth of the latter.

Larosane. (*Muench. Med. Woch.*, 1913, 291.) This is a combination of casein with calcium, containing 2·5 per cent. of lime. A white, inodorous powder, dissolving easily in warm water. Doses of 300 grains are given in milk as a nutritive.

Leptynol. (*Apoth. Zeit.*, 1913, **28,** 206.) This is a colloidal solution of lanoline and palladium hydroxide in liquid paraffin, containing 25 Mgm. of the palladium compound in each c.c. Given subcutaneously in doses of 2 c.c., the injections being made into the fatty tissue of the abdomen. According to Kauffmann, the injections have a favourable action on obesity.

Ludyl or 1151. (*Paris. Clin. et Ther.*, Feb. 5, 1913.) This substance is phenyldisulphamino tetraoxydiaminodiarsenobenzene. It contains 33 per cent. of arsenic and closely resembles galyl in its reactions and properties. The same methods of use apply. (See **Galyl**, p. 243.)

Luetin. This is the name applied to artificial cultures of the organism of syphilis, *Treponema pallida* (*Spirochaeta pallida*), prepared by Noguchi for use as a diagnostic test for the presence of syphilis.

Lymphatic Gland Extract for Enlarged Tonsils and Adenoids. (*B.M.J.*, 1913, **1,** 1159.) Ashby advances a new theory that enlarged tonsils and adenoids in children of 2 to 5 years are an attempt on the part of Nature to augment a deficient supply of lymphoid tissue ; in these children there is usually a diminution of lymphocytes in the blood and an increase of leucocytes. He suggests the use of lymphatic gland extract as an artificial supply of lymphoid tissue, and has given 5 grain tablets of the extract three times a day. The results produced are regarded as satisfactory and trial in a larger number of cases as worth pursuing.

Magnesium Sulphate, Intrathecal Injections for Eclampsia. (*Lancet*, 1912, **183,** 1575.) A sterile 25 per cent. solution was employed in the dose of 1 c.c. for every 25 lb. of body weight. The injection was made between the third and fourth lumbar spines ; the injections are regarded as useful to control the convulsions.

Mastisol. (*B.M.J.*, 1912, **2,** 976.) This is a solution of mastiche in C_6H_6 used by Von Oettingen for application to wounds, especially in field work.

Metaferrin is a brownish yellow, odourless and tasteless powder, containing about 10 per cent. of Fe and 10 per cent. of P_2O_5, combined with digested milk albumin. Prepared in tablets of 4 grains each; dose, 2 tablets three to four times a day, half an hour before or after meals. It is insoluble in the stomach, but is dissolved in the intestines.

Molyform. E. Lampé and H. Klose. (*Wien. Med. Klin.*, 1912, 831; *Apoth. Zeit.*, 1912, **27,** 396.) A white, astringent powder; soluble 1 : 10 in water; its solutions give the usual reactions for molybdenum salts. Stated to be a powerful antiseptic. Supplied in powder form or diluted in solutions 3 per cent., ointments 5 per cent. and gauzes 5 per cent. It is stated to be specially valuable for gynæcological work, and for dermatological use.

Mucusane. (*Apoth. Zeit.*, 1912, **28,** 906.) This body is recommended for use for gonorrhœa and for ophthalmic disorders. Stated to be the zinc salt of diboro-orthoxybenzoic acid, but it is doubtful if it is a definite chemical compound.

Narcophine (*Apoth. Zeit.*, 1912, **27,** 547, through *Pharm. J.*) is the double meconate of morphine and narcotine; a white powder, soluble in cold water on shaking, very soluble in hot water; 3·5 parts is equivalent in physiological action to 1 part of morphine. The narcotic action is not so rapid as that of morphine, but persists for a long period. The drug is given by the mouth and by hypodermic injection.

Neobornyval. (*Apoth. Zeit.*, 1913, **28,** 130.) This is the isovalerylglycolic ester of borneol, bornyval being the isovaleric ester. It is not attacked by acids so readily as bornyval; it resists the gastric juice and is broken up into its constituents in the intestine.

Novatophan is the ethyl ester of methylated atophan. Its action is that of atophan, but it is free from bitterness. Sold in tablets which disintegrate, but do not dissolve in water; the flaky mixture is swallowed with a further draught of water.

Novoiodine Dentate. (*Univers. Med. Record*, 3, 139.) This

is stated to be the best antiseptic for dental work. It consists of 60 per cent. hexamethylenetetramine di-iodide and 40 per cent. tricarbin.

Opon. (*Pharm. Zentralh.*, 1912, **53,** 485, through *Pharm. J.*) This is a morphine-free omnopon (omnopon is also known as pantopon). It is a light brown powder, soluble in water, and consists of the hydrochlorides of the opium alkaloids except morphine. Doses of 4 to 8 grains are sedative; after 8 to 16 grains, sleep may supervene in 15 to 45 minutes.

Orchitic Extract (*Pract.*, August, 1912) assists the thyroid gland and ovarian function; ovarian preparations found inactive, perhaps, because their function, especially in animals, is intermittent; that of the testes is continuous. Thyroid reduces sexual excitement. The action of antithyroidin is explained: when an animal is thyroidectomized, the testes, ovaries, thymus, etc., have extra work thrust upon them, and they pour an extra quantity of their secretions into the circulation. Such blood contains an extra proportion of these substances lacking in the goitrous patient, as hyperthyroidism depresses the sexual function and secretion. Orchitic extract is of value in simple goitre; less useful in Grave's disease.

Ortizone (*Amer. Drugg.*, 1913, **61,** 13) is a chemical combination of 24 parts by weight of H_2O_2 with 64 parts of carbamide. It is prepared in the form of tablets, each weighing 0·34 Gm., equal to 0·1 Gm. of H_2O_2. Ortizone is compatible with boric acid. (*See also* **Hyperol,**. *Y.B.*, **1912,** 228.)

Pancreas, Boiled Extract of, for Diabetes. (*Lancet*, 1912, **183,** 812.) Knowlton and Starling find that in the diabetic heart there is a loss of power to utilize sugar in the circulating blood. This is due to the absence of a substance derived from the pancreas normally present in the heart and blood. They prepare a pancreatic extract by grinding up the gland, boiling it in slightly acid Ringer's solution and filtering. The filtrate when neutralized and added to the blood circulating through the diabetic heart, raises the sugar consumption practically to the normal figure. The extract also improves the action of the heart itself.

Pantopon. (*Syn.* OMNOPON.) (*Apoth. Zeit.*, 1913, **28,** 82.) Mannich and Schwedes have examined this and give the following as the mean of several analyses of the same sample: Morphine,

47·5 per cent.; narcotine, 11·2 per cent.; codeine, 6·4 per cent.; other alkaloids, 10·9 per cent.; hydrochloric acid, 9·4 per cent.; water of crystallization, 9·5 per cent.

Opiopon, a similar preparation made in Germany, has been found by the same chemists to vary considerably in its composition.

Paraffin, Liquid, in Intestinal Stasis. (*Practitioner*, **90,** 448.) Jordan describes good results obtained; the liquid paraffin enters the cæcum mixed with the ileal contents and keeps the contents of the large bowel soft. Moreover, it accelerates the passage of the fæces through the large intestine, which consequently does not become overloaded. Far less bacterial action goes on and the fæces are found to contain fewer microbes. The whole of the ingested paraffin can be recovered from the stools; there is no toxic action even from large amounts.

Paraldehyde by Intravenous Injection. (*Lancet*, 1912, **184,** 818.) Noel and Souttar describe this method of administering paraldehyde. 5 to 15 c.c. of the drug is mixed with an equal amount of Et_2O and dissolved in 150 c.c. of a cold 1 per cent. solution of NaCl in sterile distilled water free from dead bacteria, or in ordinary boiled tap water. The solution, either cold or at a temperature not exceeding 25°C., is then passed into a vein through a suitable apparatus at a rate of 30 to 60 c.c. per minute. In 60 seconds the patient is unconscious, and small operations may be performed. The later effects depend on the amount given and also on the patient: sometimes a short anæsthesia is followed by some hours of sleep, at other times the whole action is over very quickly.

Paratophan (*J. Pharm. Chem.*, **6,** 122) is methyl-atophan.

Perhydrit. (*Apoth. Zeit.*, 1913, **28,** 74, through *Pharm. J.* [4], 36, 287.) This is a solid compound of H_2O_2 and urea; a light crystalline powder, permanent in dry air. Soluble in water 2 in 5, the solution having a cool, saline taste. The amount of H_2O_2 present is 34 to 35 per cent. When heated, perhydrit does not detonate, but is rapidly decomposed, giving off oxygen in large volumes. Similar preparations are known under the names hyperol and ortizone.

Pharmacological Assay of Pituitary Preparations. — Hamilton. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 1117.) The strength

of pituitary preparations is compared by the rise of arterial blood pressure caused by intravenous injections in the dog. The dog's blood pressure is first recorded; two or more standard test doses of pituitary extract (1 c.c. of solution containing 1 in 1,000 of the dried, defatted, powdered gland) are first given, and subsequently the amount of the unknown preparation determined that will produce the same rise of blood pressure.

Phenolphthalein, The Mode of Action of. (*B.M.J. Epit.*, 1912, **2**, 12.) A radiological study of the action of phenolphthalein shows that it has a direct influence upon the muscular fibres of the large intestine; its action in minute doses is precisely similar to that of scammony and jalap taken in small quantities, being concentrated upon the intestinal musculature without recognizable alteration of glandular secretion.

Phenyl-cinchonic-ethyl Ester. (*Apoth. Zeit.*, 1912, **27**, 818.) This is a yellow powder without odour or taste, soluble in water with difficulty, dissolved by organic solvents. Used for gout it facilitates in a remarkable manner the elimination of uric acid. The usual dose is 8 grains four times daily; the daily dose may be increased to 48 grains.

Phobrol. (*Pharm. Zeit.*, 1912, **58**, 622.) A 50 per cent. solution of chlorometacresol in potassium ricinoleate, soluble in water; used as a disinfectant in 0·5 per cent. solution. Solutions are colourless, keep well, and are neither caustic nor toxic.

Picric Acid as an Application for Burns, Poisoning from. (*Lancet*, 1912, **2**, 471.) Several cases of poisoning from the too free use of picric acid have been reported. Dusting powders containing picric acid should be used with caution; the 1 per cent. solution is more suitable, but should be used with care in the case of extensive burns and a watch kept for symptoms of poisoning.

Picric Acid for Ringworm. (*Pract.*, 1913, 94.) Dr. Agnes Savill has employed the lotion recommended by Dr. W. Williams and finds that when properly used it is successful. The lotion consists of picric acid 7 grains, camphor ½ oz., rectified spirit ½ oz. Applied to the clipped or shaved patch morning and evening.

Pituitary Gland Extracts. (*B.M.J. Epit.*, 1912, **2**, 12.) Wiggers (*Amer. Jour. of Med. Sci.*, April, 1911) records observations

upon the physiology of the pituitary gland and the action of its extracts. He regards the control over the body exercised by the pituitary gland as due to an internal secretion elaborated by the cells of the anterior lobe. The chemical nature and physiological action of the secretion is unknown, as it has so far resisted extraction by various solvents. The posterior lobe is not of vital importance; there is no evidence that the chemical substance found in the posterior lobe is identical with the secretion of the anterior lobe, which alone influences growth, development and life. The substance from the posterior lobe is not present in the normal circulation and its injection does not neutralize the symptoms arising from extirpation of the glands. Bernoville (*Pract.*, June, 1913) thinks that pituitary preparations will replace suprarenal preparations except for producing local anæsthesia and hæmostasis.

Polylactol. (*Apoth. Zeit.*, 1912, **27,** 716.) This is a new galactagogue composed of iron-somatose, maltose and galactose. The dose is 1 teaspoonful.

Primal. (*Merck's Report*, 1912, 365.) A solution of para-toluylene-diamine with neutral sulphites prepared for use as a hair-dye. Paraphenylenediamine and related bases can be rendered non-poisonous by introducing a sulphone group into the molecule; they can also be detoxicated by the addition of certain reducing substances without losing their properties as dyes. Primal is prepared in accordance with the latter method, and experiments have shown it to be perfectly harmless.

Quinine-Urea Hydrochloride. (*Pharm. J.*, 1912 [4], **35,** 301.) A 10 per cent. solution is of great value for tonsillitis and tuberculosis of the larynx; a 20 to 50 per cent. solution may be employed if necessary. In ulceration of the epiglottis or similar painful affections an application 10 minutes before taking food will sometimes permit of nourishment being given when other methods have proved unavailing.

Quinine Urea Hydrochloride, for Trifacial Neuralgia. (*Therapeut. Gaz.*, 1912, Dec. 12, through *Univers. Med.*) Injections of 1 per cent. solution were made (1) near the ala nasi and (2) near the intra-orbital foramen. Four injections were given with apparently permanent relief.

Radio-Oxygen Bath. W. Armstrong. (*B.M.J.*, 1912,

2, 380.) This is prepared with radio-active water of a strength of from 5 to 50 Maché units per litre; sodium perborate is sprinkled over the surface of the bath followed by a second powder, the catalyzer, which consists of a salt of manganese. Effervescence begins at once, and a great number of minute bubbles of oxygen are evolved, the process going on for from 20 to 25 minutes. The most effective and the least expensive preparation is "Radiozone" prepared by Wright, of Buxton. This gives off in each bath from 35 to 40 pints of freshly evolved nascent oxygen. The bath may be given from 98° down to 88°F.; at the higher temperatures it is most effective for insomnia and restlessness, at the lower ones in increased arterial tension.

Radiozone. (*See* **Radio-Oxygen Bath.**)

Rhodane. (*Wien. Klin. Woch.*, No. 21, 1912; *B.M.J. Epit.*, 1913, **1,** 52.) L. V. Dalmady has used sodium rhodanide (Rhodane) in the treatment of the lancinating pains of tabetics, of arterio-sclerosis and in other conditions. The single dose is 0·15 to 0·25 Gm., or 0·45 to 1·25 Gm. can be taken per day. With a few exceptions, a favourable effect was unmistakable. The drug is given in solution with syrup and water; or in drops of a 1 in 10 solution.

Risni's Ointment for Coryza. (*Amer. Drugg.*, 1912, **60,** 344.) The following is cited as the formula for Risni's ointment for use in coryza: Eucalyptol, ♏. viii; menthol, gr. ii; anæsthesin, gr. viss; adrenaline solution (1 in 1,000), gtt. v; anhydrous wool fat, ℈ii; boric acid ointment, ℥iv.

Romauxane is a nutritive preparation made on similar lines to metaferrin, but containing a high percentage of digested milk albumin. When mixed with water it effervesces and dissolves; it may be taken by itself or mixed with food or non-acid beverages. Used for debility and malnutrition, in doses of 3 teaspoonfuls daily for adults.

Sachs' Antigen. (*Practitioner*, **90,** 461; *Berl. Klin. Woch.*, Nov. 13, 1911.) Emery states that the use of this antigen for the Wassermann reaction adds greatly to the number of positive results obtained in the later stages of syphilis, and is a great improvement on other antigens. It consists of an alcoholic extract

of heart muscle to which an alcoholic solution of cholesterol is added.

Salvarsan for Pernicious Anæmia. (*B.M.J.*, 1913, **1**, 1093.) Byrom Bramwell has employed this treatment for 2½ years. The drug is given intramuscularly in order to produce sustained and continued effects. The dose employed is 0·3 Gm., given at intervals of 3 to 4 weeks. The results obtained are described as very striking and encouraging.

Salvarsan, Local Application of. (*B.M.J.*, 1912, **2**, 349.) Allport has used a local application of 1½ grains of salvarsan dissolved in ½ drachm of water and 1 oz. of glycerin added, for chronic superficial glossitis, with fissures, and ulceration; the solution was applied to the tongue every hour for 10 hours during several days, with intervals of 3, 4 and 7 days, a fresh solution being used each day. After 3 weeks' treatment the ulcers had healed and the fissures partly disappeared.

Sanocalcin is said to be a chemical compound, calcium-glycerin-olactophosphate. It is a white, amorphous powder, easily soluble in water, and is ordinarily used hypodermically or intravenously in a 1 per cent. solution. When administered by mouth the dose should be 1½ to 7½ grains. Recommended (*Amer. Drugg.*, 1912, **60**, 437) for acute and chronic infectious processes, in which it is said to stimulate the defensive agencies of the body. Sanocalcin thus finds its most useful field as an adjunct to certain specific remedies, such as tuberculin, antidiphtheritic serum, antimeningitis serum and various other biological aids to immunity.

Scarlet Red, the Uses of. (*Univers. Med. Rec.*, **3**, 223.) This drug is being more widely used. Rae and Bantlin employ it for eczematous conditions in children; also for ringworm, in which condition it must be rubbed into the lesion. Davis and Deeming suggest its use internally for chronic gastric ulcer. Nance has found it useful for ulcers and wounds of the cornea and for conjunctival injuries. The most satisfactory strength is 6 per cent., with which there is usually no irritation. Some observers have declared that scarlet-red is inert; two conditions for success must be observed: the part must be thoroughly clean and exuberant granulations must be cauterized.

Secalysatum (Bürger). This is a dialysed solution of ergot

containing in addition a percentage of cotarnine hydrochloride.

Sempervivum Tectorum for Cancer. B. F. P. McDonald. (*Lancet*, 1913, **184,** 128.) The use of juice expressed from the common houseleek was suggested in cancer because of its action in removing warts. The preparation used was made by expressing the juice of the cleaned fresh herb, allowing to stand for 2 hours, straining from the flocculent deposit and evaporating in a water-bath to half its volume. Allow to cool, filter and sterilize. The dose commenced at 5 minims and increased to 15 minims, injections being made twice weekly at one, two or three points of the disease. An ointment of the juice was also prepared and the drug used internally. Case of inoperable breast cancer improved during the treatment.

Sennatin (*Apoth. Zeit.*, 1913, **28,** 43) is a preparation of senna leaves for hypodermic or intramuscular injection; a clear sterile liquid giving the characteristic reactions for emodin and chrysophanic acid. The ordinary dose is 2 c.c., but doses of 5 c.c. cause no toxic action or unfavourable symptom.

Sodium Rhodanide. (*See* **Rhodane.**)

Splenic Extract in the Treatment of Tuberculosis. (*Lancet*, 1913, **134,** 524.) Harrower, following Bayle, considers that the spleen has an important influence upon nutrition, and that splenic extract is useful in tuberculosis. The functions of the spleen are discussed at length, and an exhaustive bibliography is given.

Sulphuric Acid, Dilute, for Boils and Carbuncles. F. S. D. Hogg and J. and R. J. Reynolds. (*Lancet*, 1913, **184,** 562 and 749.) Doses of 20 to 30 minims of dilute sulphuric acid given with two ounces of water every 4 hours have been used with great success by the authors for the conditions named; local applications consisted of dressings of carbolized vaseline. The treatment has also been used with success for streptococcic infections and for pyorrhoea alveolaris.

Syrgol is a combination of colloidal silver oxide with albumose. It is in black scales, readily soluble in water. Used in 1 to 2 per cent. solutions for injection for gonorrhœa.

Systogene (*Apoth. Zeit.*, 1912, **27,** 498) is para-oxyphenylethylamine, and is related to hordenine and adrenine. It is a

strong base, m.p. 160°C.; being insoluble, it is best employed in the form of hydrochloride.

Tannaphtol. (*Apoth. Zeit.*, 1912, **27,** 620.) A condensation product of benzonaphthol and albumin tannate. Employed internally for diarrhœa in doses of 7½ to 15 grains; externally as ointment or powder for wounds and excessive sweating.

Tetrahydropapaveroline Hydrochloride. (*B.M.J.*, 1912, **2,** 692.) Marshall has tested this substance clinically, as pharmacological experiments indicated that it might be useful in the treatment of arterio-sclerosis with commencing heart failure, and possibly also in dyspnœic conditions and heart failure due to other causes. Doses of 1 grain three times daily were used in three cases of arterio-sclerosis associated with chronic Bright's disease. The therapeutic effects were, however, disappointing; it produced no obvious effect on the form of the pulse tracing, and had less effect on the blood pressure than 2 grain doses of $NaNO_2$.

Thrombokinase (*N.Y. Med. Jour.*, 1912, **1,** 591) is prepared from fresh lung tissue by extracting with sterile water, adding a certain proportion of acetic acid, collecting, dehydrating and drying the precipitate. The powder is kept in sterile sealed tubes and is used as a local application to bleeding points in hæmophilia.

Tricalcol is a preparation of colloidal $Ca_3 2PO_4$ combined with milk albumin. Stated to be soluble in the intestines and absorbable to a high degree. One to two teaspoonfuls mixed with a little milk or water is taken daily during pregnancy; for infants and young children the dose is ½ teaspoonful.

Tricarbine. L. Mannich and P. Schwedes. (*Apoth. Zeit.*, 1912, **27,** 701.) Tricarbine is the carbonic ester of glycerin, having the formula $C_9H_{10}O_9$; a white, amorphous powder, soluble in warm water, slightly soluble in EtOH and Et_2O. The commercial substance is of about 80 per cent. purity. Suggested for use as a diluent.

Trivalin. (*Pharm. Zentralh.*, 1912, **53,** 719.) A liquid containing in each 1 c.c.: valerianate of morphine, 0·02 Gm.; valerianate of cocaine, 0·005 Gm.; valerianate of caffeine, 0·003 Gm. The dose of 1 c.c. is given daily by hypodermic injection.

Tropacocaine for Spinal Analgesia. (*B.M.J.*, 1913, **1,** 1305.) Morrison has had excellent results with this alkaloid; he uses ampoules containing 1·5 c.c. of a 5 per cent. solution, having sp. gr. 1·016 and a freezing point—1·13°C. The usual dose is 20 minims of this solution equivalent approximately to 1 grain of tropacocaine.

Tulisan. Weissmann. (*Berl. Klin. Woch.*, April 15, 1912, through *B.M.J. Epit.*, 1912, **2,** 36.) Tulisan consists of balsam of Peru 73·59; nitrate of alypin, 0·94; eumydrin, 0·47; the active substance of suprarenal gland (0·1 per cent.), 5; and glycerin, 20. The fluid is sprayed by means of a special apparatus and is used for asthma and for tuberculosis to check irritating cough.

Turtle Tuberculin. Friedmann and Piorkowsky have made preparations from what is said to be a special strain of tubercle bacilli isolated from tuberculous turtles. This strain has been re-inoculated afresh weekly for the last ten years, and has become non-virulent and atoxic. Two preparations have been made: a suspension of living turtle tubercle bacilli in physiological salt solution and a tuberculin prepared on the same lines as Koch's, but *in vacuo* at a temperature not higher than 35°C. The treatment is by intramuscular injection into the gluteal region. The suspension is first given in doses of 0·5, 1·0, 2·0 and 3·0 c.c.; later the tuberculin is used in doses of 0·1, 0·5 and 1·0 c.c., according to the condition of the patient. The smaller doses are given at intervals of eight days, the larger at longer intervals. No toxic effects are produced, and only slight infiltrations occur at the site of injection.

Typhoid Vaccine, a New Method of Preparation. (*Lancet*, 1913, **184,** 1259.) Levy and Bruch prepare typhoid vaccine by adding 1 part of galactose to 3 parts of a broth culture of typhoid bacilli, evaporating to a syrup and drying *in vacuo*. The residue is ground up and dissolved in distilled water as required for use. Its immunizing power is stated to be greater than that of Wright's vaccine; its toxicity is also greater, but this appears to diminish on keeping, while the immunizing power remains intact.

Urotropine by Hypodermic Injection. (*Univers. Med. Rec.*, **3,** 248.) Crowe and Chauffard have given urotropine subcutaneously for typhoid fever. As much as 6 Gm. may be given daily

in two or three injections. The intravenous route is contra-indicated. The method has also been used with excellent results for broncho-pneumonia and for puerperal septicæmia. The only drawback is the occurrence of albuminuria.

Uteramine. (*Rèper. Pharm.*, 1912 [3], **24,** 460.) This name has been given to synthetic para-oxyphenylethylamine. Other trade-names for the same material are *Tocosine* and *Systogene*.

Vaccine Treatment of Acne and Allied Conditions.—Galbraith. (*Practitioner*, **89,** 370.) In acne vulgaris, the acne bacillus of Unna is conceded to be the cause of the comedo; the cause of the pustulation is still a matter of dispute, some maintaining that this is due to a secondary staphylococci injection, others that it also is due to the acne bacillus. The author regards the acne bacillus as the cause of acne vulgaris in all its stages. The doses of acne bacillus vaccine found necessary to effect a cure range from 30 to 100 millions. In the mildest forms it may not be necessary to exceed 30 millions; in cases of moderate severity with comedones and superficial pustules 30 to 40 millions may suffice; in the severe comedo types doses of from 50 to 60 millions or more will be required, and in the indurata type it may be necessary to exceed 100 millions. The duration of treatment extends from 3 to 5 months in the milder cases, from 6 to 12 months in the severe forms. An autogenous vaccine is not found to give better results than a stock vaccine. Other cases treated with an acne vaccine comprise seborrhœic alopecia, alopecia areata, and the pustular stage of acne rosacea. The staphylococcus is regarded as a surface contamination which at the most can only aggravate existing pustulation.

Vaccine Treatment of Rheumatism. (*Practitioner*, **90,** 389.) Poynton in an article on "Rheumatism in Childhood" outlines his views on the pathology of the condition: the actual causal agent is a diplococcus and the avenue of infection is through the tonsils. The *Diplococcus rheumaticus* is feebly gram-positive, stains best with methylene-blue; its morphology *in vitro* is very variable and can be altered by the media. Small doses of vaccine prepared from this organism are recommended: initial dose, one million cocci, doubling each successive dose, provided there is no reaction.

Vaccine Treatment of Typhoid. Semple has had en-

couraging results. He suggests a dose of 100 millions to begin with, increased gradually to 200 or 300 millions, with an interval of 24 to 48 hours between each dose. The vaccine is administered subcutaneously in the front of the chest, 4 to 5 inches below the middle of the clavicle.

Meakins and Foster (*Canadian Med. Assoc. Jour.*, June, 1911) treated 41 cases with stock vaccines and obtained excellent results. The vaccine employed contained 6 or 7 strains and was made up in sterile salt solution containing 0·4 per cent. carbolic acid, but not sterilized by heat. 1,000 millions was the first dose, followed by 1,500 and 2,000 millions. A considerable local reaction followed the first dose, but not the others. The beneficial action on toxic symptoms was very manifest. Carriers were successfully treated by weekly injections of 2,000 millions. Leishman recommends a dose of 50 millions, and after 3 days 100 millions, then 150 millions.

Whooping Cough Treated by Vaccines. (*B.M.J.*, 1913, 1, *Supp.*, 12.) Ladd has treated a number of cases with a vaccine prepared from Bordet's bacillus. Doses of 20 millions were given initially even to an infant, but later, injections of 40 millions were given four times to babies of 9 months. Treatment was usually started in the third week of the disease, and all recovered without complication in an average of 5 weeks after commencement of treatment. A minimum interval of 5 days was allowed between each injection; no constitutional or local reaction was produced.

Zinc Iodoglycerol as an Oral Antiseptic. (*J. Amer. Med. Assoc.*, 1912, 358, through *P.J.*) The following solution may be applied to the gums every day: Water, 2; zinc iodide, 3; iodine, 5; glycerin, 10. It has a stronger action than tincture of iodine and does not destroy the mucous membrane. It exerts a powerful effect upon disease of the bone, such as caries and necrosis, and also destroys pus in ulcers and boils.

F. W. G.

PHARMACOGNOSY

Aloes, Curaçao. (*Evans' Analyt. Notes*, 1912, **7**, 6.) Two samples reputed to be the Curaçao variety did not give all the distinctive colour reactions for such, yielding no blue-green colour with strong H_2SO_4 and HNO_3 vapour. In both, the amount of

active resins, soluble in MeOH and $CHCl_3$, was abnormally low, 40·4 and 41·9 per cent. In one the water soluble constituents amounted to 83·3 per cent.; in the other, to 44·5 per cent. Both samples were almost entirely soluble in alcohol.

Arnica Flowers, New Adulterant of. — Guerin and — Guillaume. (*J. Pharm. Chim.*, 1913, **7,** 416.) The capitula of *Inula britannica* have been found as an adulterant of arnica flowers. The capitula are smaller than those of arnica. The smaller ligulate florets are bright yellow and not orange, as in arnica. The receptacle is glabrous; in arnica it is downy. The achenia are much smaller, and the bracts of the involucre are quite distinct in the two species.

Arrowroot, Bermuda, Simple Test to Distinguish from other Arrowroots. (*Bull. Imp. Inst.*, 1913, **10,** 566.) Complaints having been received from Bermuda that arrowroots from other sources are being sold under the false description of "Bermuda arrowroot," the following simple test was found to differentiate between genuine Bermuda arrowroot and Natal or St. Vincent arrowroot. About 0·5 Gm. of the sample is shaken thoroughly in a test tube with about 20 c.c. of water and poured into a small beaker containing about 50 c.c. of 2 per cent. KOH solution. The mixture is thoroughly stirred, and then set aside for 10 or 15 minutes. The three varieties of arrowroot, viz., Bermuda, St. Vincent, and Natal, show entirely different behaviour under these conditions. In the case of Bermuda arrowroot, the starch is gelatinized, a nearly clear, faintly blue liquid is produced, and there is no deposit. St. Vincent arrowroot is not gelatinized, but a white deposit of swollen granules is produced. Natal arrowroot is partly gelatinized, and gradually settles to the bottom of the beaker as a semi-transparent, gelatinous mass, leaving a clear, watery liquid above it. The test was applied to 5 samples of "Bermuda" arrowroot purchased in London; 3 of these proved to be St. Vincent. It was applied to authentic specimens of the three varieties of arrowroot and found to answer correctly in every case. The difference in the behaviour of the starches to alkali is probably due to some difference in the method of preparation. Although three grades of Bermuda arrowroot were named by wholesale dealers, only one kind is exported from Bermuda. Of these three grades, only that marked "Bermuda Opt" was real Bermuda arrowroot. The others were St. Vincent.

Asafetida as Imported. H. G. Greenish. (*Pharm. J.*, 1913 [4], **36,** 729.) An illustrated article descriptive of the commerce of the drug.

Barosma Pegleræ: A New Buchu from South Africa. R. A. Dümmer. (*Kew Bulletin,* No. 7, 1912, 326; *Pharm. J.*, 1912 [4], **35,** 613.) Specimens of a buchu sent to Kew by Miss Alice Pegler from the grassy slopes at the Qolora Mouth, Kentani, in the eastern regions of Cape Colony, appear to be new to science. *Barosma pegleræ*, Dümmer, is a perennial plant developing annual leafy and flowering shoots from a woody rootstock. The leaves are alternately disposed or sub-opposite, sub-imbricate or spreading, very shortly petiolate, oblong-elliptic, with an obtuse gland-tipped apex, $\frac{2}{3}$ to over $\frac{1}{2}$ in. long, $\frac{1}{6}$ to $\frac{1}{5}$ in. broad, leathery, glabrous, shiny, light-green; slightly convex and smooth above with a scarcely prominent midrib, paler below, with a few scattered inconspicuous glands, the margin slightly thickened and recurved, almost entire, and impressedly glandular. The species exhibits an affinity to forms of *Barosma lanceolata*, Sonder, but is readily distinguished by the broader, elliptic leaves, which are, moreover, inconspicuously glandular on their lower surfaces. Whether they will subsequently be of pharmaceutical importance must be decided by experiment.

Belladonna grown in Light and Shade, Alkaloidal Value of. W. Unger. (*Apoth. Zeit.*, 1912, **27,** 763.) The leaves of belladonna grown in the shade contained 0·35 per cent. of total alkaloids and 15·07 per cent. of ash, calculated on the dry powdered material. That grown in the sun gave 0·4 per cent. of alkaloids and 13·34 per cent. of ash.

Benzoin, Siam, Source of. (*Pharm. J.*, 1912 [4], **35,** 777.) The source of Siam benzoin is shown in the *Kew Bulletin* (No. 9, 1912) to be *Styrax benzoides*, Craib. Kerr, who has furnished the information, points out that the styrax tree which grows on Doi Sootep is not *S. Benzoin*, but a new species closely allied to *S. suberifolius*, and since described as *S. benzoides*. This tree grows rapidly, and attains a height of 12–15 m. and a girth of about 9 dm., but most of the trees are smaller, though in other parts larger trees are reported. The matter has been confirmed by the receipt at Kew of a small sample of the gum collected from the Doi Sootep trees, which in smell, taste and fumes is identical with commercial Siamese gum benzoin. It

was a homogeneous, transparent, pale-amber piece, with the characteristic odour of Siam benzoin. The principal method of collecting the gum is by making V-shaped incisions through the bark. The gum runs slowly into bamboo joints placed at the bottom of the V, and is not collected until a few weeks after the incision is made. This is generally done during the hot season. Whether any particular tree will yield gum or not can only be ascertained by tapping, as only the larger trees, and not even all of them, yield gum.

Buchu, Long, Adulterated with "Klip Buchu." W. Mansfield. (*Drugg. Circ.*, 1912, **56,** 663.) Specimens of *Barosma serratifolia* have lately been found to be largely adulterated with "Klip buchu," the leaves of a shrub growing in the same localities as the true drug. The micro-appearance of the histological elements of this false buchu are reproduced. [Presumably "Klip buchu" is *Adenandra fragrans*. The botanical source is not mentioned in the original paper, only the vernacular, name is given.—Ed., *Y.B.*]

Buchu, New Adulterant of. J. Small. (*Pharm. J.*, 1913 [4], **36,** 511.) The adulterant under notice is very similar in colour to *Barosma betulina*, and easily escapes detection on a superficial examination. It has not yet been possible to ascertain its botanical source.

Macroscopic Characters.—The shape varies from elliptical to oval; the margin is very slightly recurved; the lateral veins are scarcely visible, except occasionally on the under surface; the midrib is prominent to the apex on the under surface, but only at the base on the upper surface. In *B. betulina* the veins, except the midrib, are more prominent on the upper surface, while the midrib forms a depression for the basal third of its length, and the under surface has the midrib prominent to the apex. The apex of the false buchu is acute, not blunt, as in buchu, and is not recurved. The short petiole frequently shows a pink tinge. The surface of the leaf of *B. betulina* is described in the Pharmacopœia as glabrous, but although this is true for the interneural regions, numerous hairs are usually borne upon the upper side of the midrib for about two-fifths of its length from the base upwards. In the adulterant, the upper surface bears a considerable number of hairs, both on the interneural regions and the veins; the under surface is much wrinkled

and nearly glabrous. The texture is very similar to that of buchu, at least when the leaf is dry. No oil glands are present. The colour varies from pale green to yellow-brown; the odour is reminiscent of buchu, but this is, no doubt, due to its long association with the buchu leaves; the taste is slightly bitter, but not aromatic.

Microscopic Characters.—The upper surface has a thick cuticle, ridged by numerous straight striations; six to eight of these ridges often lie side by side on one cell, but more frequently the direction of the ridges varies considerably within the limits of a single cell. No crystals of hesperidin or of calcium oxalate are present. Pericyclic fibres, so abundant in *B. betulina*, are absent. The palisade tissue is composed of two layers on the upper side and one on the lower. This is very different from the one layer of palisade tissue present on the upper side of buchu leaves. The simple, unicellular, very thick-walled hairs are somewhat similar to those of buchu, but are distinguished by being nearly smooth, not rough, as those of *B. betulina*.

Calotropis Procera, a New Cardiac Drug. L. Lewin. (*Archiv. Exper. Path. und Pharm.*, 1913, **71,** 142; *Apoth. Zeit.*, 1913, **28,** 111.) The bark, root-bark, root, latex, flowers and leaves of *Calotropis procera* are all used and much esteemed in the East as a heart remedy. In India the plant is known as "Mudar" or "Madar"; in Arabic as "Ushar" or "Oschar"; in Burmese as "Ma-yo-pen." The author finds that the latex contains an active principle of the digitalis group. This has not yet been identified, but will probably soon be obtained in a state of sufficient purity for administration by hypodermic injection.

Camphors, Historical Note on. C. C. Bell. (*Chem. and Drugg.*, 1912, **81,** 478.) An article of considerable pharma co-historical interest.

Cannabis Indica grown in U.S.A. C. R. Eckler and F. A. Miller. (*Amer. J. Pharm.*, 1912, **84,** 488.) Soil, climate and geographical location have a decided influence upon the activity of American and Indian cannabis. Repeated plantings from carefully selected seeds of American and Indian cannabis have failed to yield a product testing over 65 per cent. as active as good Indian grown drug, while the majority of the plantings tested 50 per cent. and less. No commercial samples of Ameri-

can grown cannabis and of the drug from other sources were as active as the Indian drug, and many were 50 per cent. or more below that standard. Commercial fluid extracts were correspondingly weak. Physiological tests alone were relied on in the examination of the samples. It is considered that if American grown Indian hemp is admitted to the U.S.P., difficulty will be experienced in obtaining the drug equal in activity to Indian grown hemp.

Cannabis Indica, Greek. (*Southall's Report*, 1913, **21**, 8.) A parcel of *Cannabis sativa*, grown in Greece, proved to contain a much higher proportion of resin than the Indian-grown drug. The figures for this, and for two specimens of the latter were—Soluble in alcohol (90 per cent.): Greek, 26·23 per cent., Indian, 13·20 and 11·62 per cent.; resin: Greek, 24·22 per cent., Indian, 7·92 and 9·59 per cent.

Cascara Sagrada Bark, Adulteration of. F. A. Miller. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 1207.) Broadly speaking, cascara sagrada bark has been remarkably free from adulteration or substitution. A warning has recently been current that the bark of *Rhamnus californica* is being substituted for that of *R. purshiana*. It is said that the substitute may be detected by the fact that the medullary rays in *R. purshiana* are 1 to 3 cells wide; while in *R. californica* they are 3 to 5 cells wide. In the examination of various shipments of bark the author has found the number of rays to be 4 in only 9 per cent. of the samples examined and 5 to 6 in only 1 per cent. If this diagnostic character is of value, the amount of substitution at present is not very serious.

At the same time, inferior cascara bark does often find its way into the market. The lower grade of drug is generally due to natural causes and not to adulteration. In the course of systematic inspection of such bark a new substitute has, however, been recently detected. This resembles genuine cascara quite closely, and especially is this true of the periderm. The principle exterior difference is the more prominent longitudinally elongated lenticles of the substitute compared with the small inconspicuous transversely elongated ones of the cascara. The inner surface, however, of the large pieces is the key to the ready detection of the adulterant. The colour in the false bark is a light brown with frequent darker blotches. None of the yellow or lustrous brown of the true bark is evident. The inner surface

and fracture are also diagnostic, being in the spurious article, respectively striate and fibrous, while in the cascara they are smooth and short. The bark is practically odourless and the taste is only that of astringency with slight bitterness. The size and form of the adulterant cannot be regarded as important characters, since they both exhibit about the same range of variations as the genuine bark. The adulterant is somewhat flatter, showing no tendency to form quills, and is slightly thicker. The microscopical structure of the false bark is totally different from that of *R. purshiana*, the most striking feature being the extremely prominent medullary rays. The article is illustrated by drawings.

Cayenne Pepper, Sweet or Non-Pungent. E. M. Holmes. (*Pharm. J.*, 1913 [4], **36**, 626.) Two kinds of sweet or non-pungent cayenne are imported into this country. One, from Spain, consists of the fruits of *Capsicum annuum*, var. *grossum*. The other, from Hungary, is *C. annuum*, var. *szegedinense*. The latter and the fruits of *C. tetragonum* are the source of the condiment "paprika," so largely used is South Eastern Europe.

Charlock in Mustard, Chloral Hydrate Test for. A. L. Winton. (*Orig. Com. 8th Intern. Congr. Appl. Chem.* (*Appendix*), **26**, 409–11; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7**, 2072.) The reagent is prepared as follows: Dissolve 16 Gm. of chloral hydrate in 10 c.c. H_2O. Add 1 c.c. of strong HCl. Mount 10 Mgm. of the mustard flour or prepared mustard on a slide in the reagent, heat cautiously (not to boiling) for a moment and examine under a lens. Fragments of charlock thus acquire a carmine-red colour.

Cinchona, Root Bark of. L. Rosenthaler. (*Apoth. Zeit.*, 1913, **28**, 33, 41.) The micro-characters of the root bark of the following varieties of *Cinchona* are minutely described. *C. succirubra*, *C. robusta*, *C. ledgeriana*, and *C. ledgeriana* × *succirubra*. A table is given showing the results of the chemical analysis of the root bark compared with ordinary commercial stem bark and a specimen of cultivated Javan bark, 30 years old. The percentages of total alkaloids found in the root barks were: *C. succirubra*, 7·01; *C. robusta*, 6·29; *C. ledgeriana*, 8·89; *C. ledgeriana* × *succirubra*, 8·53; commercial bark, 7·13; old Javan bark, 5·67.

Cinnamon and Cassia Barks, Commercial. H. E. Sindall.

(*J. Ind. Eng. Chem.*, 1912, **4,** 590.) Tables are given showing the ash content observed during 4 years for "broken China" cassia, Ceylon cinnamon chips, broken Batavia and Sargon cinnamon, and Seychelles cassia.

Cinnamon, the History, Cultivation and Commerce of. (*Chem. and Drugg.*, 1913, **82,** 115.) A descriptive and historical article on Ceylon cinnamon, illustrated with plantation photographs.

Cubebs. (*Southall's Report*, 1913, **21,** 12.) Petroleum spirit extract (dried over H_2SO_4) determined on five samples showed very divergent results, ranging from 6·49 to 15·66 per cent. Two batches of the powdered drug yielded 6·70 and 6·99 per cent. of ash respectively. A few specimens examined were rejected as containing a considerable proportion of fruits of other than the official drug.

Digitalis, Growth of, in U.S.A., and a Review of its Medical History. J. U. Lloyd. (*Amer. J. Pharm.*, 1913, **85,** 212.) An interesting account of the growth of digitalis in the United States. The plant can be easily cultivated there. In some districts it has become naturalized. Around Cloverdale, Oregon, it forms flower spikes 9 feet in height.

Digitalis, Keeping Properties of. R. A. Hatcher and C. Eggleston. (*Amer. J. Pharm.*, 1913, **85,** 203.) It is found that commercial digitalis leaves of good quality do not undergo any deterioration in many instances as the result of age; in a few cases they do appear to have deteriorated, but only with extreme slowness—at a rate probably not exceeding 1½ to 2 per cent. a year. The same statement holds for the Pharmacopœial preparations made with a menstruum containing at least 50 per cent. of alcohol. Heat below 120°C., applied for a reasonable length of time, does not cause deterioration in digitalis leaves, aqueous infusions, or alcoholic preparations; in the latter case even though the preparation be reduced to a soft solid. The acetic fluid extract of digitalis is worthless. Liquid digalen is decidedly inferior to the alcohol-containing galenical preparations of digitalis in so far as permanency is concerned. Experiments are given from which these conclusions are drawn. A general survey of the literature of the subject is made.

Drug Culture in India. D. Hooper. (*Pharm. J.*, 1913

[4], **36,** 552.) The following official drugs are indigenous to India or are recognized as East Indian : Aconite, areca, Indian hemp, capsicum, cardamom, cassia fistula, chirata, cinchona, croton oil, hemidesmus, kino, linseed, nux vomica, castor oil, opium, pepper, pomegranate bark, red sandal wood, sandal wood, senna, tamarind. The following are at present grown only on a limited scale, and are capable of extended cultivation : Aloes, belladonna, caraway, coriander, colchicum, colocynth, digitalis, fennel, gamboge, ginger, henbane, ipecacuanha, jalap, liquorice, podophyllum, rhubarb, saffron, stramonium, turpentine oil.

Belladonna grows well on the Himalayas from 6,000 to 1,200 feet above sea level. Watt states that this district might supply the world, yet at present the drug is imported. The plant has no chance of succeeding on the plains.

Aloes grows freely at Karachi, on the coast. The plants are probably *A. abyssinica*, Lam., the source of the Jaferabad aloes. They are extremely succulent, and with little labour an inspissated juice could readily be made from the leaves. Should the commercial supply become scarce the Sind coast would afford abundant material for an indigenous extract.

Colchicum autumnale.—Attempts have been made to grow meadow saffron in India, but with very little success. It appears desirable to institute an inquiry into an allied plant, *Colchicum luteum*, Baker, as a substitute. This plant grows on the slopes of the Western Temperate Himalayas, and the roots constitute the Hermodactylis of the Greeks and the bitter "Surinjan" of the Indian bazars. The alkaloid, colchicine, has been detected in the corms and seeds, and a supply has been sent to England for chemical and physiological investigation. Should *C. luteum* be found to be equal in activity to *C. autumnale* its cultivation could be readily extended.

Digitalis purpurea.—Foxglove grows in Himalayan and other temperate regions in India. Ainslie, writing more than a century ago, says that in his time it was grown in Bangalore. It is quite acclimatized on the Nilgiris, and grows without any attention. These hills have supplied the medical stores with the dried leaf for many years. The plant is perennial at Arrigadh, in the United Provinces, and its cultivation was taken up in 1880 with a view to furnish the Indian Medical Department. The superintendent, writing in 1885–6, did not anticipate any difficulty in supplying the Medical Stores with the annual require-

ment of 60 lbs. In some hill districts its growth is slow, and the old plants have a habit of damping off in the rains. The plant, grown near Ootacamund, supplies 100 lbs. of dry leaf each year to the Medical Stores Department, Madras. It is easily raised from seeds sown at any time during the spring months. The plant does not survive after being stripped of its leaves. Martindale has examined some Indian-grown leaf, supplied by the author, and the chemico-physiological tests compare favourably with those of the leaf grown in England.

Hyoscyamus niger.—Henbane is a native of the Temperate Himalaya from 8,000 to 11,000 feet. It was for a long time successfully cultivated at Hewra, Deccan, by Dr. Gibson, and at Dapuri, near Poona, by Lush, for the supply of the extract to the Bombay Medical Stores. Henbane was introduced into the Saharanpur Botanic Garden about the year 1840, and since that time up to the present day the Indian Medical Department has obtained all its annual requirements in the shape of extract and dried leaf. It is sown at Saharanpur during October in rich, highly manured soil. It grows very fast and requires no care further than thinning and weeding in the early stages and attending to the water supply afterwards. Leaf is plucked and dried from the latter end of December to the end of January, and the extract is made during February.

Ipecacuanha.—Although the attempts to acclimatize ipecacuanha have been a qualified success, and the drug produced has been of good quality, more persistent efforts are requisite to make the cultivation a permanent success.

Ipomoea purga, Hayne.—Experiments have been made in the cultivation of jalap tubers near Ootacamund, Nilgiri Hills, prior to 1870. The regular cultivation commenced in 1877. The plant is readily propagated by root and stem cuttings placed 3 by 3 feet apart in peat soil. The plant being herbaceous and throwing out twining stems, it is supported by stakes or trellis work in the same manner as ordinary garden peas. An acre of land will give 1,000 lbs. of dry tubers at a cost of 3 annas per lb. The Medical Store Depot at Madras has for some years been supplied with this drug from Ootacamund. Jalap is a drug that responds readily to manuring. The amount of active resin found in the root is between 10 and 12 per cent., which answers to the requirements of the B.P. In 1896 experiments were made with fertilizers, and it was found that the percentage of resin increased to 1 per cent. in tubers grown with phosphoric

manures. One large tuber which had grown in the neighbourhood of a manure heap afforded as much as 22 per cent. of resin, which may be considered the largest yield on record. In Northern India the cultivation of jalap has not been so successful. The annual requirements for jalap in the Medical Stores, Bengal, are 2,000 lbs.; Bombay, 1,000 lbs.; and Madras, 1,200 lbs. There is no reason why the whole of this supply should not be obtained from the Cinchona Plantations, Ootacamund.

Podophyllum emodi.—Since the announcement made by Dymock and the author in 1889 that the root of Indian podophyllum was richer in active resins than the American podophyllum the drug has been frequently examined and has secured a position in the Indian and Colonial Addendum to the British Pharmacopœia. The demand for the root is still on the increase, as it is sometimes difficult to obtain a sufficiency of the American drug. The Forest Department has taken up its cultivation in the Punjab, United Provinces, and the North-West Frontier Provinces, and several maunds of dry root are now supplied annually. In Kamalhan and Malkandi, where the climatic conditions are favourable, the cultivation is being extensively carried out.

Drugs, Anhydrous Alcohol and Ether Extracts, and Ash of Certain. J. R. Rippetoe and R. Minor. (*Amer. J. Pharm.*, 1912, **84**, 433.) A table is given showing the amount of moisture, alcoholic extract, ether extract, ash and ash soluble in dilute HCl of over 250 samples of drugs.

Drugs, Ash and Moisture of Powdered Vegetable. A. and A. N. Thurston. (*J. Amer. Pharm. Assoc.*, 1913, **2**, 474.) The results of the determination of the moisture and ash of over 70 powdered drugs are tabulated. The percentage of ash soluble and insoluble in water and the alkalinity of both are also given.

Drugs, Powdered, Ash Standards for, Difficulty in Fixing. E. L. Patch. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 1120.) The author demonstrates from results obtained with 1,000 pound lots of drugs that most published ash "standards" are misleading, and are practically unattainable in grinding, even if over 25 per cent. of the first siftings through 80 sieves, after passing through rollers, are rejected, as shown by the following examples:

Belgian valerian.—One thousand pounds select root run

through rolls and passed over No. 80 sieve gave 227 pounds or 22·7 per cent. of drug assaying 68 per cent. ash. The remaining 773 pounds assayed 10 per cent. ash. A sample of the whole root washed, brushed and dried gave 5·2 per cent. ash. In this case after discarding 22·7 per cent. of drug the remainder assayed nearly twice as high as a specially prepared sample; yet it would hardly be practical to undertake any better cleaning of large quantities of root. Probably the extractive yield of the drug to menstrua has been based upon a drug not even cleaned as well.

Culver's root.—One thousand pounds select root broken on rolls and sifted over No. 80 sieve gave 242 pounds of powder yielding 66 per cent. ash. The remaining 758 pounds of percolation powder gave 6·5 per cent. ash. A select cleaned sample gave 2·9 per cent. ash.

Several other similar results are given. In the case of drugs having an alkaloidal standard it is doubtful if an ash standard should be established.

Drugs, Storing and Preserving. R. R. Roth. (*Drugg. Circ.*, 1912, **56,** 722.) After garbling, all crude vegetable drugs should be stored in tins with tight-fitting lids, or metal lined drawers with good lids. Such drugs, and the powders prepared from them, should never be stored in open wooden drawers. Drugs in bulk should be stored in a dry place, away from direct sunlight, and not directly on the floor. Some drugs are very subject to the attacks of insect pests. (See also *Y.B.*, **1911,** 233.) It has been suggested that a tuft of cotton saturated with $CHCl_3$ occasionally introduced into the container will do much to check the depredations of insects in small parcels of drugs. Semi-annual exposure of the bulk of the stock, spread out in the open air in dry weather, is also recommended. [Since the drug boring beetles are lucifuge, exposure to bright sunlight is most effective in ridding infested drugs of the perfect insects; but is useless for dislodging the larvae, or grubs, buried in the interior of the material.—Ed., *Y.B.*] Chemicals should, when possible, be stored in glass and away from direct sunlight. Efflorescent salts should not be stored in open drawers. Essential oils should be kept in small, filled, well-corked bottles. It is suggested that if one of these is partially emptied it may be again filled with water; the oil floating on the water could be decanted as required. [Moisture in any form, even when

invisible and dissolved in the oil, greatly hastens chemical change in a large number of essential oils—*See Y.B.*, **1912,** 92.]

Gentian Powder, Adulterated. F. von Bruchhausen. (*Apoth. Zeit.*, 1912, **27,** 754.) A specimen of powdered gentian root, which yielded only 19·8 per cent. of aqueous extractive, was found on micro-examination to contain a number of foreign yellowish stone cells, with dark-coloured cell contents, traversed by minute canals. The lumen contained air and appeared, by interference, as bright black dots. These were identified as being cells of powdered coconut shell. This material is exported from America for the purpose of drug-adulteration. Besides this, the sample showed foreign pollen grains and leaf structures which were attributed to *Artemisia absenthium.* These were probably due to careless grinding.

Gentian, Powdered, Continental, Presence of Dock Root in. A. Tschirch. (*Schweiz. Woch. Chem. Pharm.*, 1912, **50,** 581.) In Continental powdered gentian, a considerable amount of schlerenchyma, which is foreign to the true drug, is often met with. These cells give Borntraeger's reaction for emodin, which is not present in gentian. The impurity has been traced to the roots of *Rumex crispus* and *R. latifolius*, common plants in the regions where *Gentiana lutea* grows. The contamination of the gathering of gentian root with these dock roots is considered to be accidental.

Gum Resins, Fetid, Botanical Sources of. J. Small. (*Pharm. J.*, 1913 [4], **36,** 287.) The author has examined the micro-structure of the fruits of the various umbellifers in the herbarium of the Pharmaceutical Society's museum producing fetid gum resins, and has compared them with those found in commercial samples of the drug. The herbarium specimens included *Ferula fetida*, Regel ; *F. narthex*, Boiss ; *F. fetidissima*, Regel and Schmalhausen ; *F. jaeschkeana*, Vatke ; *F. teterrima*, Karelin and Kirilow ; *F. alliacea*, Boiss ; and *F. rubicaulis*, Boiss. Sections of all these and of the fruits found in the commercial drug are drawn. From the structure of the latter it is found that a white variety of asafetida examined contained the fruits of *Ferula rubicaulis.* A sample of mixed red and white gum contained two fruits, those of *F. rubicaulis* and of *F. fetida.* The fruits found in sagapenum indicate that it is also derived from a species of *Ferula* different from any of those

above mentioned. The fruits contained in commercial galbanum are those of *Ferula galbaniflua.*

Hairs, Diagnostic Value of, in the Micro-Examination of Herbs and Leaves. J. Small. (*Pharm. J.*, 1913 [4], **36,** 587.) The author gives illustrations of the micro-appearance of the hairs and glands of a number of herbs belonging to the N.O. *Boraginaceae, Solanaceae, Scrophulariacae, Labiatae* and *Verbenaceae.* Attention is directed to their diagnostic value. The points to be observed in such an examination are detailed.

Henbane Seed Mixed with Russian Poppy Seed. C. Griebel and C. Jacobsen. (*Zeits. Untersuch. Nahr. Genussm.*, 1913, **25,** 9.) Out of 34 parcels of poppy seed tested two were found to contain henbane seed, to the extent of 0·32 and 0·26 per cent. respectively. Henbane seeds are easily detected by suspending the sample in water, and examining the seeds with a lens. Hyoscyamus seed is recognized by its grey or yellowish brown colour, and finely pitted seed coats. The microscopical structure is also distinctive both from poppy seeds and from the caryophyllaceous seeds which are often found in Russian poppy seed.

Hops, Comparison of, from Different Geographical Sources. H. V. Tartar and B. Pilkington. (*Indust. Eng. Chem.*, 1913, **6,** 478.) Chemical analysis shows that the quoted market price is absolutely no criterion of the value of the hops for brewing purposes. The cheapest hops frequently contain much more of soft, bitter resins than higher priced parcels. Oregon hops are equal in this respect to those grown in any other part of the world. English hops are inferior in this respect to a greater number of the American varieties.

Hydrastis Canadensis, Cultivation of. J. J. Stingel and J. O. Baldwin. (*Amer. J. Pharm.*, 1912, **84,** 299; *ibid.*, 1913, **85,** 148.) Full cultural directions are given for growing this important drug on the commercial scale.

Indian Drugs, Notes on. D. Hooper. (*Pharm. J.*, 1912 [4], **35,** 391.) *Camelthorn Root.*—A sample of the root of camelthorn (*Alhagi camelorum*), from Cawnpore contained a wax, resin, tannin, tannin anhydride, organic acid, sugar, quercetin, and colouring and mucilaginous matters. It yielded no alkaloid. Its properties

being mildly astringent, the root would appear to have no recommendation as a febrifuge, although it has a local reputation as a remedy for malaria.

Belladonna Leaves.—A sample of leaves of *Atropa belladonna* grown in Kashmir contained 0·27 per cent. of alkaloid—an average yield compared with the European drug.

Belladonna Root.—Roots of belladonna plants cultivated at Jeolikote afforded 0·4 to 0·45 per cent. of alkaloid. A sample from Kashmir also gave 0·45 per cent. The cultivated Indian root is therefore of average medicinal quality.

Croton Bark.—It has been reported that the bark of *Croton tiglium* is one of the ingredients of the Abor arrow poison. The bark is intensely acrid, and when applied to the arm in a fresh state it causes irritation and raises pustules. An aqueous, also an alcoholic extract were prepared from the bark. These were examined by Major J. W. D. Megaw, I.M.S., with a view to finding the minimum lethal dose on guinea pigs. 0·63 Gm. of the watery extract inserted in a pocket under the skin produced marked local irritant symptoms and caused death in five days. 0·2 Gm. of the alcoholic extract injected subcutaneously caused death in 4 hours. 0·1 Gm. caused death in 28 hours. Both cases were attended with marked local irritation. The extracts are of a comparatively low degree of toxicity for guinea pigs, but the experiment proves that the fresh bark contains a poison of a distinctly virulent type.

Gardenia "Gum."—The white exudation occurring after longitudinal cuts had been made in the upper part of the stem of *Gardenia turgida*, but which did not form at the base of the tree, dried to brittle concretion, sweetish to the taste, and found to contain mannitol. The occurrence of manna in this genus is remarkable, since other species of gardenia are known to yield a yellow fragrant resin, called dikamali resin.

Ginger.—In testing some samples of cultivated ginger root it was necessary to traverse the statement made by S. J. Riegel in 1891 (*Y.B.*, **1892,** 168) that East Indian ginger yields 8 per cent. of oleoresin, and that Jamaica ginger contains about 5 per cent. It was found that on estimating the pungent resinous principle by means of alcohol, either of 90 per cent. strength or absolute, the dried extract contained sugar and other matters soluble in water. The amount of washed oleoresin would therefore be a more accurate criterion of the value of the root. A few Museum samples and recently dried samples from the

local market were extracted with strong alcohol and the extracts washed with water. The following results were obtained :—

	Alcoholic Extract.	Washed Resin.
Punjab	11·1	8·1
Rough, Calicut	9·3	7·0
Bleached, Calicut	6·0	4·0
Unbleached, Calcutta	5·7	5·1
Bleached, Calcutta	5·1	4·6
Freshly dried, Geoukhali	8·4	3·9
Freshly dried, Hoogly	7·9	4·3
Freshly dried, Rungpur	11·8	5·1
Freshly dried, Rungpur	9·3	4·7

(See also *Y.B.*, **1909,** 38, and *Gen. Index.*)

An interesting experiment was made in the Kumaon Government Gardens to ascertain if ginger increased in value by being left longer in the ground. The root is usually harvested in December, and for purposes of the trial a sample was collected that month ; another portion of the crop was lifted in February ; and a sample of the original " Soont " from which the younger roots had grown was also taken. These were analysed :—

	Harvested in December. 1911.	Harvested in February. 1912.	Original " Soont."
Extract	6·4	8·3	14·0
Washed resin	3·0	3·5	4·1
Ash	6·5	6·8	7·2
Moisture	11·1	10·4	9·7

These results demonstrate that young ginger develops more oleoresin the longer it is allowed to grow.

Saffron.—Crocus sativus cultivated experimentally at Quetta afforded saffron.

Salep.—A sample of the large ovoid corms of orchids obtained from Lahore bazaar in 1908 was examined. The powder had the following composition : Moisture, 9·65 ; albuminoids, 8·62 ; carbohydrates, 77·73 ; fibre, 1·15 ; ash, 2·85 ; phosphoric anhydride, 0·55.

Indian Blistering Beetles.—Mylabris cichorii, Fabr., and other species of *Mylabris* have been used for many years as a substitute for cantharides. The beetles are collected for commercial

purposes at Gwalior, and are supplied to all the medical store depots. K. Dieterich in 1901 found these beetles to contain from 0·73 to 1·92 per cent. of cantharidin, while the Spanish flies yielded on an average 0·7 per cent. Eldred and Bartholomew in 1908 recorded the occurrence of 1·24 and 1·36 per cent. During the year samples have been obtained from the principal Indian store depots and submitted to analysis. The following figures were obtained :—

	Cantharidin.	Ash.	Moisture.
Calcutta	1·47	8·7	11·0
Bombay	1·02	5·7	10·2
Lahore	1·26	5·3	7·7
Madras	1·12	7·2	10·5

This result is satisfactory in showing that the drug used in India contains over 1 per cent. of cantharidin. The dried beetles do not appear to lose their active principle on being stored. The sample from Calcutta was marked as "old stock 1910," yet it contained the largest amount of cantharidin.

There is evidence that the amount of vesicating principle depends upon the species of beetle employed. A sample of *Cantharis hirticornis* from the Murree hills, Punjab, yielded as much as 2·02 per cent. of cantharidin.

Inula Helenium Root, Micro-Crystals in. O. Tunmann. (*Pharm. Zentralh.*, 1912, **53,** 1175.) Crystals of alantoic anhydride, up to 150 μ long and 5 to 10 μ broad, in the form of needles or rhomboids, are invariably present in elecampane. They may be readily seen by treating sections or powder with dilute HNO_3. They are not soluble in cold water, but dissolve on warming, which distinguishes them from alanto camphor. On treatment with dilute NaOH they dissolve, and afterwards crystallize as sodium allantoate. If warmed in dilute H_2SO_4 they are converted into white needles of allantoic acid, resembling $CaSO_4$ in appearance. They form oily drops with $ZnCl_2$ + I reagent. On microsublimation oily drops are obtained, which show crystalline structure only after several days.

Insect Powder, Dalmatian and Montenegrin. E. Juettner and P. Siedler. (*Berichte Pharm.*, 1912, **22,** 7 ; *Pharm. Zentralh.*, 1912, **53,** 1432.) A full description of the cultural

methods and compilation of published literature on the subject. Powdered stems and expanded flowers are the chief adulterants of the powder. *Chrysanthemum leucanthemum* is known as false insect flowers, also *Pyrethrum indicum* and probably any other composite flower such as *Tanacetum bellis*, and *Matricaria* may be used. Pure insect powder should not be bright yellow, but greenish. A bright colour is often produced by adding turmeric, or the yellow wood of *Chlorophora tinctoria*. Barium chromate has been found as a colouring and also lead chromate. The tests for these and other impurities are given, also a review of the published methods for chemical valuation. Wood-cuts of the histological elements of pure insect flower powder and of the stem powder are also reproduced.

Insect Powder, Testing of. P. Siedler. (*Apoth. Zeit.*, 1913, **28,** 230.) The determination of the Et_2O extract, by means of a Soxhlet apparatus, is the best method of assaying insect powder. The amount of essential oil in the extract, between 0·99 to 1·57 per cent., should be determined, since it probably plays no unimportant part in the toxic action of the powder. The ash of insect powder ranges from 7 to 8·6 per cent.; the portion of this insoluble in HCl is from 0· to 0·2 per cent. on the original drug. Powdered stems is the chief adulterant. Other flowers are but little used. (See also *Y.B.*, **1908,** 69; **1910,** 171; **1911,** 172, 185, and *Gen. Index.*)

Ipecacuanha Powder, Keeping Properties of. — Ebren. (*J. Pharm. Chim.*, 1913, **7,** 163.) Powdered ipecacuanha kept in paraffin sealed powder bottles for over 10 years was found to have undergone no material loss of total alkaloids, the only change being a slight bleaching of colour.

Jalap. (*Southall's Report*, 1913, **21,** 13.) Nine samples of the drug have been examined during the year, of which but two contained the amount of resin required by the B.P. One of these yielded the unusually high percentage of 21·34 per cent., the remaining seven contained less than 9 per cent., the lowest figure being 5·12.

Lathyrus Sativus: A Poisonous Horse-Pea. E. M. Holmes. (*Pharm. J.*, 1913, 4, **36,** 795, 837.) These seeds, which are sold in this country under the name of "mutters," are extremely poisonous to horses. Unfortunately, the name is also used in Calcutta and in the Eastern portion of India to designate the

harmless field pea, *Pisum arvense*, and the garden pea *Pisum sativum*. The correct Hindustani name for *Lathyrus sativus* is kesari. This name, or the botanical name alone, should be used in this country. *Pisum sativum* and *P. arvense* are imported and sold in this country as "Indian peas," and are allowed, by the custom of the trade, to contain 15 per cent. of the poisonous *Lathyrus sativus* seeds. It is also often sifted out of Indian barley and sold as a waste product.

There are several varieties of the *Lathyrus sativus*, one white, another with purplish, a third with blue flowers, and another form with narrow leaves, and similarly there are also varieties of the seed as met with in those imported from different districts of India. They also vary in size and markings. These are all, however, easily distinguished from all other commercial varieties of "peas" by the curious angular shape, which is that of a short thick wedge. At the thicker end there is seen a small, oval scar or hilum near one corner, and not far from it a raised dark polished point; from this there runs, in several varieties, a dark line which is continued round the seed along the middle of its narrow edge, so that the seed is rectangular at the back, flattened at the two sides, and tapers down from the back to a thin, obtuse edge in front. On account of its shape, when mixed with peas and placed on an inclined plane the round peas roll off, but the *Lathyrus sativus* does not. Hence they are separable with comparative ease, and the separation could be easily effected in an appropriate machine such as are used by seedsmen to separate weed seeds from garden seeds. For the same reason, when the mixed seeds are poured from one vessel into another they become unequally mixed. The commonest form of *Lathyrus sativus* seeds imported into this country are greyish-green in colour, speckled or mottled with darker spots and lines, which are sometimes so crowded as to give a blackish tint to the seeds, but in other varieties, as in the brown, uniformly blackish, and pale varieties are not so noticeable. The dark line round the edge is not noticeable in the brown, blackish, or the large white variety that comes from the Baltic under the name of Riga pea, which is often met with in chicken's food. In size the seeds vary from 2–3 mm. broad and 2 mm. deep at the thicker end to 4–5 mm. broad and 4 deep. This is the ordinary size of which the bulk of the "mutters" or Indian seeds of *Lathyrus sativus* consists. The large white Riga "pea" is usually 6–7 mm. broad, and about 5 mm. deep at the thicker end. Al-

though these peas are very poisonous and has been long known, its nature has not been definitely determined. It is gradual and cumulative in its effect. The symptoms of lathyrism are very marked, the horses being affected with paralysis of the larynx which causes "roaring," or suddenly falling; the animals exhibit sudden and distressing symptoms of dyspnœa, for which tracheotomy is often necessary to save life. The amount of the peas which will produce toxic symptoms is variously estimated. A. J. Voelcker considers that 2 per cent. in the feed is dangerous, since the poison is cumulative. Its presence in horse food, whether whole or ground, in any quantity, should not be permitted. The prohibition of the sale of such fodder containing any "angular" peas would probably be the safest means of preventing its use. From a communication by D. Hooper to the author, it appears that lathyrism is a serious disease to those among the natives of India who use peas as an article of diet. There it is considered that boiling lessens the toxicity.

Lawang Bark, Botanical Source of. (*Southall's Report*, 1913, **21.**) Schimmels have expressed the opinion that the Malayan "Lawang" bark from which E. W. Mann has obtained an essential oil (*Y.B.*, **1912,** 473) is derived from *Cinnamomum iners*, Reinw. E. M. Holmes finds, however, that the bark is distinct from the bark of *C. iners* in the Imperial Institute Museum.

Licorice Root. (*Chem. and Drugg.*, 1913, **82,** 773.) Illustrated by photographs, the article deals with the cultivation, collection, preparation and commerce of licorice root in Asia Minor and Russia.

Licorice Root and Senna, Powdered, of Commerce. H. G. Greenish and Dorothy J. Bartlett. (*Pharm. J.*, 1913 [4], **36,** 365.)

1. *Powdered Licorice Root.*—The official description of licorice root is not so precise as might be desired. The drug is described as the peeled root and peeled subterranean stem of *Glycyrrhiza glabra*, Linn., and other species. Every variety of licorice root is, therefore, official, provided it complies with the official characters. These require that the drug, before it is peeled, should be dark brown, and should not be scaly; that the peeled drug should be yellow, and that it should have a sweet taste, free

from bitterness. As the peeled drug alone is official, the characters of the unpeeled drug are valueless; they indicate simply the desire to exclude the Russian root, derived from *G. glandulifera*, W. K. The absence of any mention of brown patches indicates that a root of uniform yellow colour, and, therefore, of good quality, is demanded. The absence of bitterness is presumably intended to exclude the Russian root. Taste is, however, so subjective a character that it is unreliable. An endeavour was made to separate the bitter principle by the method of Tschirch and Cederberg (*Y.B.*, **1907,** 73), and by other methods but without success. Considering that licorice root is used solely for its sweetening power, which is due to the glycyrrhizin it contains, and that the drug obtained from *G. glandulifera* is richer in this principle than that obtained from *G. glabra*, there would seem to be no sufficient reason for excluding Russian licorice from the B.P. On the Continent it is generally preferred, and if we add to these considerations the difficulty of deciding whether a given sample of the powder is made from Russian root or not, the rational course seems to be to admit both, provided they are of good quality.

Nine samples of commercial licorice root were obtained and examined for their yield of aqueous extract and ash. The aqueous extract was determined by shaking 5 Gm. of the powdered root frequently during 24 hours with 100 c.c. of chloroform water, filtering, evaporating 20 c.c. of the filtrate in a flat-bottomed nickel dish, and drying at 100°. The ash was calculated on the drug dried at 100°. The following results were obtained :—

YIELD OF AQUEOUS EXTRACT AND ASH FROM COMMERCIAL LICORICE ROOT.

	Aq. Ext.	Ash.
1. Spanish	24·9	3·5
2. French	28.6	3·8
3. Sicilian	32·5	5.2
4. Turkish	37·1	3·7
5. Anatolian	24·4	7·8
6. Persian, large	24·3	4·7
7. Persian, small	32·4	3·3
8. Russian	28·9	3·6
9. Russian	38·3	6·4

Thirty-two samples of powdered licorice root obtained in various parts of the United Kingdom were then examined. The moisture was determined by drying 1 Gm. for 2 hours in a steam oven. Each sample was also examined microscopically. The results are given in tabular form.

The Committee of Reference in Pharmacy has recommended that licorice root should be required to yield not less than 20 per cent. of aqueous extract and not more than 6 per cent. of ash. In three out of the thirty-two samples examined the amount of aqueous extract fell below this recommendation, and in nine the limit of ash is exceeded. The microscopical examination shows that six are undoubtedly adulterated, two have admixtures that are probably accidental, and four are prepared from roots of very low quality. Fifteen are prepared from roots practically free from dark patches, but six of these exceed the limit of ash, though not to any serious extent. In no case was the presence of powdered almond shells, sometimes found in foreign-ground drugs, to be detected. The percentage of aqueous extract ranged from 16·4 to 43·7 per cent. and of ash from 3·5 to 7·4 per cent.

There can be little doubt that these unsatisfactory results are due to the purchase, at a low price, of powders of inferior quality, as there is no difficulty in obtaining a powder of good quality if a reasonable price is paid. Powdered licorice root may well be required to be pale yellow in colour and to yield not less than 20 per cent. of aqueous extract and not more than 6 per cent. of ash.

2. *Powdered Senna.*—Practically the only two varieties of senna leaves regularly arriving in the London market are Alexandrian and Tinnivelly. Both, and particularly the latter, occur in various grades, in addition to broken leaf, small, and siftings. The lower qualities, especially of Tinnivelly leaves, are dull in colour and often marked with dark patches, the tissues of which these patches consist have, under the microscope, a dark reddish-brown colour.

It was considered sufficient to determine the moisture and ash and to examine the powder microscopically.

The results of the examination of twenty commercial samples are given in tabular form.

It has already been shown (*Y.B.*, **1901,** 165) that senna leaves of good quality, dried at 105°C, do not yield more than 13 per cent. of ash. This maximum figure is, however, seldom reached,

It would exclude three out of the twenty samples. In addition to these, six others showed excess of sand when examined under the microscope. Of the remaining eleven, only five appeared to be made from really good green leaves. It is, of course, well known that powdered senna, when exposed to the light, changes in colour, but this change in colour is not accompanied by the production of the dark reddish-brown colour in the tissues which occurs in leaf of low quality. No intentional adulteration could be detected. The presence of stalk, seed and fruit recorded in some of the samples is evidence of low quality, but not of adulteration. In the case of powdered senna, therefore, there appears to be a similar disposition to purchase low instead of high grade powders.

Lignum Nephriticum. J. Moeller. (*Berichte Pharm.*, 1913, **13,** 88.) Although "*Lignum nephriticum mexicanum*" has long been known as a South America drug, its botanical source was not known until lately. It is now traced *Pterocarpus amphymenium*, D.C. (*Amphymenium pubescens*, H.B.K.; *Pterocarpus pubescens*, Spengel). This was long ago described by F. Hernandez under the name of "*Coatlis*" or "*Tlapalez patli*." Another variety of *Lignum nephriticum mexicanum*, called by Hernandez "*Quauchinacensis*," is probably *Pterocarpus orbiculatus*, D.C. Merrill has shown that the botanical source of *Lignum nephriticum philippinensis* is *Pterocarpus indicus*, and *P. echinatus*, also *P. blancoi*, Merrill, *P. santalinus*, Blanco. The *Lignum nephriticum* of commerce from Manilla is also the heart wood of *P. santalinus*. All these woods have a reputation as remedies for urinary diseases. They all give a more or less pronounced blue fluorescence when treated with water containing lime.

Manaca Root, Recent Adulterant of. F. A. Miller. (*J. Amer. Pharm. Assoc.*, 1913, **2,** 594.) The supply of crude manaca on the drug markets of the United States, at the present time, consists largely of an unidentified adulterant or substitute. This form has recently been noted in all samples examined in the proportions of from 76 to 100 per cent. It is claimed by importers that this substitute is genuine manaca, and that the lighter colour of the root is due to a difference of soils in which the drug grows. No significance is given the structural differences, which are equally as manifest as that of colour. Manaca root varies in thickness from 5 to 30 mm. and in length from 1 decimetre to 1 metre. Externally it is dark reddish-brown. The

bark is thin, usually scaly or flaky, and adheres tightly to the wood. It is distinctly bitter. The wood is tough, hard, and of a reddish-yellow colour. It is only slightly bitter. The wood is porous, the pores being scarcely visible under a hand lens. The medullary rays are few in number and only visible under a hand lens. The substitute varies in thickness from 7 to 25 mm. and in length from 1 to 4 decimeters. Externally it is yellowish grey. The bark is twice as thick as that of manaca, not scaly or flaky, and separates readily from the wood. It is practically tasteless. The wood is fragile, slightly softer than that of manaca, and of a pale yellow colour. The wood is tasteless. It is porous, the pore being distinctly visible under a hand lens. The medullary rays are numerous and plainly visible. Photographs of the genuine and spurious drug are reproduced. [Presumably the root of *Franciscea uniflora*, Pohl., is referred to. The botanical source is not stated: only the vernacular name is given.—Ed., *Y.B.*]

Manna Ash, Pharmacognosy of. G. B. Zanda. (*Arch. Farmacol. Sper.*, 1913, **15,** 66; *Chem. Zentralh.*, 1913, **1,** 1779.) The propagation of the manna producing ash trees *Fraxinus ornus*, *F. pendula* and *F. excelsior* is described, also the method of obtaining the manna. The relative proportion of fraxin and mannitol in the different trees at various seasons of the year is given. Old stems which have yielded manna contain more mannitol than young untapped stems. To separately determine mannite and fraxin the aqueous extract of ash bark is precipitated first with neutral, then with basic lead acetate. The mannitol is determined in the filtrate either gravimetrically or optically. Fraxin is liberated from the Pb precipitate by means of H_2S. After filtration and evaporation, the residue is taken up with a little water, deprived of tannin, and the fraxin crystallized from alcohol. It may be determined quantitatively by hydrolysing with HCl and titrating the sugar formed with Fehling's solution. When the mannite content is high, that of fraxin is low, and vice versa.

Manna, New Kind of, from Rhodesia. J. R. Furlong and L. E. Campbell. (*Proc. Chem. Soc.*, 1913, **29,** 128.) The manna is formed as a white, slightly sweet incrustation on the leaves and twigs of a species of *Gymnosporia*, probably *G. deflexa*, Sprague. On adding alcohol to the solution of the manna in water dulcitol crystallized out in lustrous prisms,

m.p. 183°C. or 188°C. (corr.) It was present to the extent of 54 per cent. The residue after removing dulcitol contained 6·4 per cent. of reducing sugar calculated as dextrose and 6·6 per cent. of sucrose.

Marjoram Leaves Adulterated. T. F. Hanausek. (*Archiv. Chem. Mikros.*, 1913 [2]; *Apoth. Zeit.*, 1913, **28,** 230.) Commercial broken marjoram leaves have been met with adulterated with whitish leaves which were at first taken for pieces of *Althea* leaves. Microscopical examination showed that although these bore stellate hairs, these differed in structure from the hairs of *Althea*. The adulterant was identified as being particles of *Cistus salvifolius* leaves. The histological characters of these are given. A chemical test to detect the adulterant consists in floating the particles of leaf on strong hot KOH solution. The pieces of Cistus leaf are coloured deep black violet and the liquid is also coloured. *Althea* and marjoram remain green.

Marjoram Oil, Botanical Source of. E. M. Holmes. (*Perfum. Record*, 1912, **3,** 322; **4,** 6, 41, 69.) Considerable confusion seems to prevail concerning the essential oils met with in commerce under the name of marjoram oil. Recently, a parcel of oil was imported from France under the name of Origanum oil, French (Marjolaine). The character of this was so distinct from true marjoram oil, that inquiry instituted as to the herb from which it had been distilled showed this to be *Calamintha nepeta*, which is stated to be called Marjolaine in the district where it was distilled. The use of vernacular names for such products is to be deprecated as tending to lead to trouble in business. *Origanum marjorana*, the cultivated sweet marjoram, "Marjolaine douce," should be the source of the true oil. *Origanum vulgare*, or wild marjoram, is known by the equivalent French name "Marjolaine sauvage." The oil of the true marjoram is at present chiefly distilled in Spain. Descriptions of the plants *Origanum marjorana* and *Calamintha nepeta* are given and illustrated.

Not only is vernacular nomenclature worse than misleading, but botanical names, unless the name of the botanical authority follows, are equally misleading. For instance, there are three different plants with the botanical name *Origanum creticum*, namely: *O. creticum*, Linn.; *O. creticum*, Schousbee; and *O. creticum*, Sieber. Moreover, two different plants are sometimes

mixed before distillation; or one species being exhausted, another having a similar habit or odour is substituted. Oil of marjoram from the following four species have been distilled and examined by chemists: *Origanum marjoranoides*, Willd.; *O. onites*, Linn.; *O. maru*, Linn.; and *O. hirtum*, Link. These plants are figured and described in detail, and compared with *Origanum syriacum*, *O. aegyptiacum* and *O. compactum*.

Medicinal Plants, Cultivation of. J. A. Borneman. (*Amer. J. Pharm.*, 1912, **84**, 546.) Cultural details for growing *Digitalis purpurea* (the florist's variety, *D. gloxiniflora* was used), *Atropa belladonna*, *Hyoscyamus niger*, *Cannabis sativa*, and *Hydrastis canadensis* are given, as well as directions for harvesting and drying. Although these apply to the growth of crops in Pennsylvania, U.S.A., the practical details may be useful to growers in this country. The following assays of active principles of the drugs are given: Digitalis, first year's leaves; digitoxin, 0·304 per cent.; Minimal lethal dose (of tincture ?), 0·6 c.c. = 166·669 of normal. Belladonna: mydriatic alkaloid from root, 0·53 per cent.; from leaves, 0·58 per cent. Hyoscyamus: mydriatic alkaloids from second year's leaves, 0·06 per cent.

Medicinal Plants, Cultivation of, Inquiry of the Dominions Royal Commission on. (*Pharm. J.*, 1912 [4], **35**, 515.) Evidence bearing on the commerce and cultivation of drugs has been given before the Dominions Royal Commission by Messrs. J. C. Umney, H. E. Evans, E. M. Holmes, H. G. Greenish, K. C. Allen, E. V. Barrett and others. It was considered that many drugs not now cultivated in Great Britain and the Colonies might be grown profitably on the commercial scale.

Medicinal Plants, Improvement in, by Cultivation. F. A. Miller. (*Pharm. J.*, 1912 [4], **38**, 367.) The importance of scientific control in the cultivation of medicinal plants is emphasized. Improvement by means of seed and plant selection, the isolation and testing of favourable varieties, study of soil and climatic conditions, trials in hybridization and grafting have hitherto been tried only to a very limited extent in the cultivation of medicinal plants. In the U.S.A. experiments are now being conducted in connexion with the selection and growth of many drugs, especially *Hyoscyamus* and *Digitalis*.

Medicinal Plants in U.S.A., Work of the Department of Agri-

culture on. R. H. True. (*Amer. Drugg.*, 1913, **61,** 27.) The commercial prospects of drug cultivation in the U.S. has received considerable attention from the State official department. The communication is a résumé of work done in this direction, with illustrations of plants grown at the experimental farm at Arlington, near Washington, including digitalis, stramonium and cascara; also camphor trees in nursery, ready to set in hedges, at Orange City, Florida.

Medicinal Plants, Results of Ten Years' Cultivation of. J. Chevalier. (*Nouveaux Remèdes*, 1913, **30,** 169, 217.) The author details the practical results obtained in the course of 10 years' successful cultivation of medicinal plants at Houdan. The impression that cultivated plants are necessarily often inferior in activity to those grown wild is due mainly to improper cultural treatment and specially to unsuitably prepared soils. Full directions for the treatment of various crops are given. The chief plants cultivated at Houdan are: Belladonna, stramonium, henbane, aconite, hemlock, colchicum, convallaria, Indian hemp, asarum, galega, angelica, caraway, parsleys, coriander, rue, mints, lavender, thyme, hyssop, melissa, sage, chamomile, lactuca, horse radish, wormwood, southernwood, tansy, soapwort, Province rose, cherry laurel, black currant and valerian. Trials are being made with digitalis, hydrastis, tagetes, ageratum, soy, glaucium, lobelia and catha edulis. The results are so far satisfactory, both practically and financially. An important point apart from growing the crops in suitable soil, is hybridizing the cultivated plants with more active varieties. Thus, the Thuringian *Valeriana minor* with a yellow root is more active than the yellow-rooted variety of *Valeriana minor* usually cultivated in France. By careful selection of seed from well-grown plants yielding richly the desired constituents, a strain of specially active plants may be secured. By this method of selection a crop of parsley fruit of 1,500 kilos per acre has been obtained, the fruits yielding 6·5 per cent. of apiol. A strain of stramonium has been raised in which the fruits are absolutely devoid of prickles; therefore, the large leaves are not torn by the wind, and gathering is greatly facilitated while the alkaloidal value is maintained. The proper drying of the crops is as important as their correct cultivation. Drugs which are rich in essential oil may be dried in a current of air at the ordinary temperature. Drugs containing glucosides and easily

altered alkaloids must be quickly and thoroughly dried in a current of dry warm air. Also it is necessary to be able on the drug farm to use up the by products and the second grade of the crops for the distillation, on the spot, of essential oils, or the separation of crude alkaloids or active principles. Details are given of the chemical constitution of the soil at Houdan and of the local cost of raising and distilling a hectare of peppermint.

Mustard, Seeds and Powder, of French Commerce. P. Carles. (*J. Pharm. Chim.*, 1913, **7**, 535.) The French Codex requires that mustard powder for medicinal use shall contain at least 0·7 per cent. of essential oil. The commercial seeds are not all capable of furnishing such a powder. The following are the percentages of C_3H_5CNS found in the seeds enumerated: Bombay, 0·85; Bari, 0·81; Alsace, 0·95; Levant, 0·99; English, 1·25; Russian, black, 0.07; white, 0·06. Although some of these are poor in oil, there is a considerable commercial demand for them; probably to blend with the better sorts and to thus make them of more uniform strength. A rough and ready test of the value of mustard powder may be made by mixing 10 Gm. in a beaker with 50 Gm. of water. In 10 minutes a good mustard will give a marked odour of mustard oil. Another form of mustard is also found in commerce. This is that from which the fixed oil has been removed either by expression or by extraction with CS_2 or petroleum ether. Many of these are very rich in C_3H_5CNS, since the amount of fixed oil removed may amount to 33 per cent. The effect of sifting the ground seeds has also been inquired into. It is found that the first siftings, consisting of the most easily powdered portions of the seeds, are the richest C_3H_5CNS, then the middle portion, less easily powdered, and finally the gruffs, consisting chiefly of the seed coats, contained but relatively little essential oil.

Nux Vomica Seed, False. J. Small. (*Pharm. J.*, 1913 [4], **36**, 510.) A new kind of nux vomica seed was recently sent over from Burmah and offered to manufacturers, but on examination it was found to contain no strychnine. The seed is of a light grey colour externally and yellow internally. The yellow endosperm is much lighter in colour than that of *Strychnos nux vomica*. The outer surface is densely covered with closely

appressed hairs. The seed is flattened, round, or elliptical, and has a ridge around the edge where the two disc-shaped masses of endosperm meet. There is no trace of bitterness in the taste. Transverse radial sections of the seed were cut and examined. The three tissues present are the endosperm, the layer of collapsed parenchyma, and the hairs. The internal mass of endosperm is almost identical with that of *Strychnos nux vomica*. The outermost layer shows a slight difference. In the genuine nux vomica seed the cells of this layer have frequently more or less triangular ends, as seen in section, while in the false seed these cells are more usually square-ended. These cells vary somewhat, and square ends occur rather too frequently in the genuine seed to permit of any diagnostic value being attached to this character. The layer of parenchyma is the same in both seeds. The bases of the hairs are practically identical, but the angle which the rest of the hair makes with the hair base is slightly larger in the false than in the genuine seed. The longitudinal, rod-like thickenings, which form the wall of the hair in each case, show a slight difference. In the genuine seed these thickened parts usually remain coherent at the tip of the hair, but in the false they frequently separate and show a slight curvature at the extreme end. These insignificant differences, of course, are of no value in the examination of the powdered drug, and if the seed is entire it is easily distinguished by its lighter colour and the ridge round the edge, as well as the complete lack of bitter taste. No distinctive colour reaction could be found to distinguish the elements of the false seed in a mixture with the genuine drug, since the positive reactions for strychnine afforded by the latter would render the negative reaction of the false seed undetectable.

The microscopical structure of section of true and false seeds are drawn.

Opium, its Components and Substitutes, Pharmacological Action of. J. Pal. (*Deutsch. Med. Woch.*, **1913,** 395; *Apoth. Zeit.*, 1913, **28,** 183.) In natural opium, the bases of the morphine group and those of the iso-quinodine or papaverine group have antagonistic physiological action. This explains the difference observed between the action of opium and of morphine. The opium effect depends on the relation of both groups of bases to each other. Consequently, satisfactory results can be obtained from the so-called opium substitutes only when the alkaloids are properly balanced, as they occur in the drug.

The theory that papaverine and narcotine are relatively inactive is not correct.

Paprika, Powdered, Microscopy of. O. Varga. (*Archiv. Chem. Micros.*, 1912, **5**, 305; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7**, 847.) Paprika is not usually adulterated with foreign vegetable matter, since this would spoil the colour. Corn meal is most frequently found; and traces of corn starch derived from the use of corn meal used to clean the grinding mills. The most frequent adulterant is artificial colouring with coal tar colours. This can be detected by mounting the powder in glycerin. Normal tissues are then yellowish; generally when foreign dyes are used, stained fragments can be detected.

Pepper, Unsatisfactory U.S. Official Standard for Nitrogen in Ether Extract of. C. H. La Wall. (*Amer. J. Pharm.*, 1913, **85**, 243.) The requirements laid down in Circular No. 19 of the Bureau of Chemistry of the U.S. Department of Agriculture, specify that the Et_2O extract of black pepper should contain not less than 3·25 per cent. of N; and of white pepper 4·0 per cent. of N. As a matter of fact, the requirement is purely arbitrary and possibly subject to seasonal or other natural variation, or to the time of collection of the berry. Analyses made recently of a number of samples of both white and black pepper show ten instances of white pepper in which the N percentage ran below the U.S. standard for this factor. All other characteristics are normal with the exception of one sample ash, and insoluble ash were high. The black peppers, with one exception, showed a figure for N content of the ether extract in excess of the minimum requirement.

Peppercorns, Adulterants of. A. Troccoli and G. Verona-Rinati. (*Zeit. Untersuch. Nahr. Genussm.*, 1912, **24**, 737.) In addition to the common adulterants the authors have found buckthorn berries and the fruit of *Schinus molle* substituted for the genuine pepper, the latter adulterant being readily detected by its hard kernel. Artificial peppercorns are occasionally manufactured from a great variety of well-known adulterants by mixing with flour paste and moulding into the proper shape. Another form of adulteration is pepper dust and refuse, and in some cases of a mixture of rice flour, powdered talc and bone-black, applied as a coating over low-grade peppercorns, the coating being made to adhere by means of starch paste,

mucilage or syrup. The coatings amounted to 25–70 per cent. of the total weight of the products. They are easily detected by soaking in water, which disintegrates the foreign matter. One sample of this character contained as a core the seed of *Trifolium incarnatum* instead of pepper, these seeds being heavily coated with dirt and refuse from pepper warehouses, cemented together with some binder. In this case the pepper tissues amounted to 31·3 per cent., the balance being foreign matter, of which 14·7 per cent. remained after ignition. These artificial berries were not disintegrated by water but were easily crushed, so that the coating could easily be stripped from the enclosed seed as a doughy mass.

Perfumes, Ancient Egyptian. L. Reutter. (*Schweiz. Woch. Chem. Pharm.*, 1913, **51**, 369.) The results of the examination of eight different specimens of ancient Egyptian perfume powders are detailed and summarized in tabular form. The substances found include styrax, storax, myrrh, frankincense, thus; possibly mastic and bdellium; opopanax, bitumen, fruit sugar from grape pulp, cassia and palm wine; and henna extract.

Persian Cummin. (*Perfum. Record.*, 1913, **4**, 43.) A recent shipment of Persian cummin seeds has attracted attention to this variety. They yielded oil having the sp. gr. 0·911; α_D + 7°; η_D 1·4980; aldehydes 18 per cent. The oil is sweeter in odour than ordinary cummin oil. It does not contain any carvone, and the amount of cumic aldehyde is small. E. M. Holmes states that similar fruits have been in the Pharmaceutical Society's museum for at least 30 years, under the name of *Carum nigrum*; Lindley, however, named the plant producing black cummin as *Carum gracile*. The differences between this plant and *C. carui* are figured and described. E. C. Sage has examined the micro-characters of the mericarps of Persian cummin, comparing them with those of *Carum carui* and *Cuminum cyminum*. From these it appears that the Persian fruits are more nearly allied to a *Carum* than a *Cuminum*. Plants will have to be grown from the seeds to establish the genus and species.

Peruvian Balsam, Historical Note on. J. Knott. (*Med. Press*, 1913, **146**, 521.) A collection of extracts from the quaint correspondence of Monardus on the virtues of Peruvian balsam, in the years 1568, translated into English in 1596.

Quinas or Quininas, and other Brazilian Antiperiodic and Febrifuge Drugs. J. R. Monteiro da Silva. (*Nouveaux Remèdes*, 1913, **30**, 25.) The "quinquinas" *Cinchona calisaya*, *C. condaminea* and *C. succirubra* are not known to occur in Brazil. They may, however, yet be found in the Amazon forests, or elsewhere. There are, however, a large number of "quinas" and antiperiodic drugs of undoubted value in the republic. "Quina de Goyaz," *Ladenbergia*, Klotsch; or *Cascarilla magnifolia*, Wedd., furnish a red bark which may be substituted for cinchona, and is but little inferior to these in efficacy. "Quina de Rio," *Ladenbergia hexandra*, Kl., *L. lambertiniana*, Kl. and *L. lambertiana*, Kl. (sic), are used for paludian fevers. *Remijia roraimal*, Schum., *R. macronemia*, Wedd, and *R. firmula* are all valuable. "Quina de Serra," *Remijia ferruginea*, is also widely known as *Quina de Remijia*, Will., or *Galipea febrifuga*, St. Hil.; is used as a stimulant tonic bark. "Larangeiro de matto," another "Angostura," is derived from *Essenbeckia febrifuga*. The Simarubaceous *Quassia amara* Linné, "Quassia pao amargozo," is much esteemed and said to afford an alkaloid quassine (?) used for atonic dyspepsia. Under the names "Parahyba," "Pao Parahyba," or "Pé de Perdrix," *Simaruba versicolor*, St. Hil., is very common in some districts. "Colunga," *Simaba ferruginea*, St. Hil., affords a remedy for dysentery. "Gentiana de Brazil," or "Raiz amargosa," is obtained from *Centaurea spicata*, Aubl.; and *Lisianthus pendulus*, Mart., furnishes a bitter root equivalent to European gentian, so do the roots of *Centaurea minor* and *Dejanira rubescens*. "Caferana," another bitter febrifuge, is derived from *Tachia guyanensis*. Among the *Apocynaceae*, "Pao Pareira" *Geissospermum velozii*, known also as "Uba assu," "Camara de bibro," "Forquilha." "Quina de Matto" is derived from *Exostema floribundum*, Pers., and also from *Machaonia braziliensis*, Cham. Another "Quina de Matto" comes from *Baptisia cuspidata*, Hook, fil. Another Quina of great value is "Quina rouge," or "Quina de Campo Santo," *Strychnos pseudo quina*, St. Hil. *Strychnos*, *S. triplinervia*, Mart., also furnishes a root-bark which has a great reputation as a bitter tonic. Notwithstanding that these belong to such a poisonous genus, no ill effects have been observed to follow their use. "Quina cruzicro," *Solanum pseudo-quina*, is another bitter drug used in popular medicines as a substitute for cinchona, although no quinine has been detected in it. Several members of the N.O. Rutaceae are also

known as "Quinas": "Quina" and "Tres folhas do matto." *Galipea jasminiflora;* St. Hil., and *Tricofera, febrifuga*, St. Hil., *Arapoca amarella* and *Raputia magnifica* also yield bitter febrifuge barks. Under the name of "Angostura" *Cusparia trifoliata,* "Canudo amaryoso et tinguaciba" furnishes a bitter febrifuge bark. It contains an alkaloid pereirine, a very efficient antiperiodic (?). It is used for "Eau anglaise," an esteemed bitter tonic. "Peroba," *Aspidosperma peroba,* Friere Allem., also has a tonic febrifuge bark. The variety known as *revessa* yields an active principle perobina (sic). Another bark "Casea paratudo," "Paratudo Rowalfio Planolet," gives a tincture which, when diluted with water, shows a blue fluorescence like that of quinine; and its properties resemble those of cinchona. Under the name of "Butua miuda," *Cocculus filipendula* root is prescribed for bladder affections. "Butua legitima," *C. platyphyllus,* also known as "Pareira brava" and "Bagu da praia," is similarly used. The roots are said to contain an alkaloid, pelosine. Under the name "Mil homens" or "Fahrinha" *Aristolochia cymbifera* also furnishes tubercular roots which are used for similar purposes as the "quinas" and "Butuas." Another *Aristolochia,* "cipo mil homens," or "Farinha Aristolochea macrura," is also much esteemed.

Rhamnus Purshianus Bark, the Medullary Ray Cells of. H. Kraemer. (*Amer. J. Pharm.*, **84,** 385.) Pharmacognocists have attached much importance to the number, arrangement, and shape of the medullary ray cells for the differentiation of closely allied drugs. Thus, it is stated that the bark of *Rhamnus purshianus* may be distinguished from the closely similar R. *californicus* by the width of these rays. In *R. purshianus* they are 2 cells wide; in *R. californicus* 3 to 5 cells wide. Taking cascara sagrada bark as a type, the author describes the cell structure of the medullary rays, and insists on the importance of examining tangential and tangential-longitudinal sections as well as the usual transverse section. Also care should be exercised in noting the plane of section in the preparations examined. The article is illustrated.

Rheum Rhaponticum, Detection of, in Powdered Rhubarb. — Juillet. (*Bull. Pharm. Sud-Est; Répertoire,* 1913, **25,** 249.) The method consists in isolating the rhaponticins of Tschirch and Cristofoletti (*Y.B.*, **1907,** 135). Ten Gm. of the powdered root is percolated in the cold with alcohol 60

per cent. so as to obtain 25 Gm. of percolate. After filtration if necessary, it is evaporated on the water-bath at 80°C. until the residue weighs 7 Gm. This is extracted with 10 c.c. of Et_2O. After separating the Et_2O and setting it aside, a crystalline brownish deposit of rhaponticin will form in about 4 hours. If the rhubarb is a mixture of three parts of rhapontic rhubarb with one part of the official root, the crystallization will not be complete for 24 hours; and will require several days if it be a mixture of 1 part of rhapontic with 3 of Chinese rhubarb. The crystals of rhaponticin formed are fine needles, insoluble in Et_2O, $CHCl_3$, C_6H_6; slightly soluble in warm acetone, $HC_2H_3O_2$ and EtOH. They give a red colour with alkalis and give off a bitter almond odour with HNO_3. (See also *Y.B.*, **1912,** 204.)

Rhodium, Source of Essential Oil of. E. M. Holmes. (*Perfum. Record,* 1912, **3,** 224.) From information received from G. V. Perez of Teneriffe, it is evident that the "Canary rosewood," which is the source of genuine rhodium oil, is derived from *Convolvulus scoparius*, which grows wild. The wood of *Genista vergata,* which was also regarded as a possible source, has no odour. Moreover, the plant is extremely rare. (See also *Y.B.*, **1911,** 80.)

Rhubarb, Micro-Detection of, by Means of Antiformin. D. Scherbatschew. (*Apoth. Zeit.*, 1912, **27,** 961.) Antiformin affords a useful reagent for detecting rhubarb mixed with other powders. It gives a bright red colour with the parenchyma and medullary rays, and clears the oxalate-bearing tissue, rendering the crystals more evident. It also affords a useful means of clearing other vegetable drugs. It destroys starch and renders the tissue formation more distinct, besides giving characteristic colour reactions with certain cell contents.

Saffron, H_3BO_3 as a Natural Constituent of. R. Krzizan. (*Zeits. Öffentl. Chem.*, 1913, 90; *Apoth. Zeit.*, 1913, **28,** 230.) The fact that the ash of a sample of saffron gives a positive reaction when tested for H_3BO_3 with turmeric paper does not necessarily indicate adulteration with borax. The ash of genuine saffron, free from adulteration, is found to contain sufficient B_2O_3 to give a distinct reaction. The author has previously met with "prepared" saffron which was adulterated with over 10 per cent. of borax. If a small quantity of this adulterated saffron were mixed off with a larger amount of the genuine drug,

it would not be possible to detect the fraud by a simple qualitative test. (See also *Y.B.*, **1911,** 232.)

Saffron, New Adulterants of. — Wasicki, also — Nestler. (*Pharm. Zeit.*, 1913, **58,** 328.) The small tubular florets of *Onopordon acanthium* as stated by Wasicki to be used to adulterate saffron. They are easily detected by the five angular teeth of the petals at the end of the tubular coralla. When examined by the microscope all parts of the flower have stellate crystal glands : and the corolla teeth bear club-shaped glandular hairs. Nestler has found Spanish saffron to be adulterated with particles of a papilionaceous plant, loaded with heavy-spar dressing and coloured with cochineal. This is readily detected by floating the adulterated drug on water.

Sandalwood and its Oil. E. M. Holmes. (*Perfum. Record*, 1913, **4,** 161.) The author deals first with the history of the prevalent "spike disease" among plants of *Santalum album*. An account of the culture and methods of protecting sandalwood with an enumeration of some of the plants which serve as hosts to this parasite follow. The other species yielding "sandalwood oil" are considered; at present only *Amyris balsamifera* attains commercial importance. It does not appear probable that any real substitute for the oil of *Santalum album* will be forthcoming.

Santonica Flowers, Micro-Chemical Test for the Presence of Santonin in. G. Heyl and O. Tunmann. (*Apoth. Zeit*, 1913, **28,** 248). Santonica flowers are met with in commerce which have all the characters of the genuine drug, but yet contain no santonin. Even the histological characters are not sufficiently distinct to allow a definite conclusion from mere micro-examination. By means of the zinc chloride iodine reagent, however, the identity of the santonin crystals which will be observed under the microscope can be definitely established. Santonin crystals are at first coloured yellow, show cracks and fissures, and suddenly melt into deep yellowish-brown drops. These changes occur in 10 to 20 minutes and can be followed under the lens. Any crystals which either dissolve to a colourless liquid in the reagent, or remain unaffected by it, are not santonin. Santonica often contains a large quantity of siliceous particles which have a crystalline aspect under the microscope.

Santonica, Devoid of Santonin. H. La Wall. (*J. Amer. Pharm. Assoc.*, 1913, **2**, 596.) A specimen of santonica was recently examined which contained not more than traces of santonin. The appearance of the drug was very favourable as to colour and freshness. It was rather greener than the santonica commonly seen, and possessed an odour slightly different from the ordinary santonica odour and strongly suggestive of tansy. The microscopic examination showed it to be more tomentose than the drug usually is, and the oil glands were of a greenish colour. It gave no crystalline santonin by any method of extraction. The ether extract was found to be 18·6 per cent., and therefore normal. This is a proof that the drug had not been exhausted. Pain's test (*Y.B.*, **1901**, 487) satisfactorily enables the worthless drug to be distinguished from that containing a full amount of santonin. Place 0·5 Gm. of santonica (whole or ground) in a test tube, add 5 c.c. of spirit of nitrous ether and boil gently. No colour should be developed or not more than a slight greenish-yellow colour due to the solvent action of the alcohol on the resins of the drug. Now add 10 drops of alcoholic KOH and again boil. In an active drug a rose-red colour is developed in direct proportion to the amount of santonin present. In the sample under question, scarcely any colour was noticeable.

Santonica, Spurious, containing no Santonin. P. Siedler. (*Apoth. Zeit.*, 1912, **28**, 230.) During the past few years santonica flowers which contain no santonin have been met with in Russian commerce. These are practically undistinguishable microscopically from the genuine drug. They give considerably less extract with EtOH 90 per cent., 41 per cent., as compared with 58 per cent. from the genuine drug. The extract from the worthless flowers is pale green; that from the active drug dark brownish green. The determination of santonin by Katz's method (*Y.B.*, **1900**, 134) gives good results. The amount found in the genuine drug varied from 1·5 to 2·8 per cent.

Stramonium as a Source of Mydriatic Alkaloids. F. T. Gordon. (*Amer. Drugg.*, 1913, **61**, 28.) Since stramonium grows rankly all over the U.S.A., it is suggested as a profitable source of mydriatic alkaloids. Moreover, cultivation has been shown to increase greatly the yield of alkaloids, especially of hyoscya-

mine. Stramonium could probably be used as the source of hyoscine or of atropine, as well as of the first-named base.

Verbena Oil, Spanish, Botanical Source of. E. M. Holmes. (*Perfum. Record*, 1912, **3**, 212.) From material submitted from Spain the plant from which Spanish "verbena" oil is distilled is identified as *Thymus hyemalis*, Lange: it is closely allied to the "lemon thyme" cultivated in gardens.

Veratrum Album Powder, Adulterated. (*Evans' Analyt. Notes*, 1912, **7**, 137.) An adulterated sample is reported on. This gave 5 per cent. of ash and 6·8 per cent. of extractive with EtOH. An authentic sample gave 11·4 per cent. of ash and 13·7 per cent. of EtOH extractive. The adulterated sample yielded only a trace of alkaloids. It contained much foreign coniferous tissue and stone cells, and possibly exhausted veratrum.

PHARMACOLOGY AND THERAPEUTICS.

Adonis Vernalis, Pharmacology of. J. Chevalier and —Pouchet. (*J. Pharm. Chim.*, 1913, **7**, 372.) *Adonis vernalis* is a valuable drug having a diuretic action allied rather to that of squill than to digitalis. Its action is due mainly to its being a renal irritant or excitant. Preparations of fresh plants do not, in small doses, occasion diarrhœa in healthy animals, but there is an augmentation of diuresis. With large doses which occasion gastro-intestinal irritation, the profuse diarrhœa caused may somewhat mask the diuretic effect. Salivation is also produced by large doses. Adonis is an azoturic diuretic. In consequence of its elective action on the kidneys it may act where digitalis has failed. For therapeutic use preparations of the fresh plant are to be preferred.

Arrow Poisons of South African Bushmen. L. Lewin. (*Naturwiss. Woch.; Pharm. Zentralh.*, 1913, **51**, 133.) The juice of the bulb of *Haemanthus toxicarius* evaporated to an extract is used by the Bushmen to poison their arrowheads. The toxic principle is an alkaloid, *haemanthine*, which is a mydriatic paralysant of the nervous system. It is very stable. With H_2SO_4 it gives a violet colour reaction and green colour with HNO_3. Another more slowly acting poison is obtained from certain *Coleoptera*. The beetle, *Damphidia simplez*, has long

been used as a poison. The author finds that the perfect insect, larvae and pupae of the beetle *Blepharida coanida*, are also used for making arrow poisons. This beetle poison, as used, is an albumin-like mass. It probably contains several toxic principles. An albuminoid poison has been found in the aqueous maceration of the larvae of *Blepharida*. The beetle poison usually takes some time to act. Several hours or even days may elapse before its victims finally succumb to its effects.

Chemical Constitution and Pharmacological Reaction, Studies on the Relation between. C. R. Marshall. (*Pharm. J.*, 1913 [4], **36**, 622.) In the course of an instructive lecture on this subject the author deals with the effect of ionization, from the pharmacological point of view, of solutions of inorganic salts; the structure of organic compounds; their modification in action by additive processes; the effect of the nitro esters; of lactones; of stereoisomeric substances; of tropeines; and of quaternary compounds. The original lecture should be read.

Chemical Structure, Relation of, to Physiological Action: The Aliphatic Compounds. J. Grier. (*Pharm. J.*, 1913, **36**, 430.) The connexion between chemical structure and physiological action is traced by the hypotheses of the earliest times and the experiments of modern investigators.

Croton Seeds, Pharmacological Action of. L. Itzkowitsch. (*Apoth. Zeit.*, 1913, **28**, 8.) Subcutaneous injection of croton oil into frogs occasions haemorrhage from the mucous membrane of the mouth, and of the internal organs, but the mucous membrane of the stomach and intestines is not affected. Frogs withstand croton oil better when it is administered by the mouth than when given by hypodermic injection. No alteration of the internal organs can be detected by the microscope. Death ensues from paralysis of the nervous system. Crotin, a mixture of two albuminoids which Elfstrand has obtained by precipitating croton extract with EtOH, or with Am_2SO_4, occasions paralysis of the central nervous system of frogs; but produces no pathological lesions of their organs. It does not affect the blood corpuscles of men, guinea pigs and horses; it haemolyses those of the blood of rabbits, hedgehogs, snakes and fowls: cats' blood corpuscles are unaffected or but slightly haemolysed. The blood corpuscles of sheep, cattle, pigs and frogs are agglutinated. The action of crotin on the

blood is destroyed by healing to 60–70°C. Pig's pepsinogen mixed with crotin arrests its action on the blood. The blood of frogs surviving after croton poisoning shows, *in vitro*, no resistance to croton reaction, and such frogs form no anticroton.

Cyanide Poisoning, Martin and O'Brien's Antidote for, and Adrenine Solution to Retard Absorption in. J. L. Jona. (*B.M.J.*, 1913, **1**, 271.) Martin and O'Brien's antidote consists of three reagents : (No. 1) Ferrous sulphate, 100 grains, dissolved in distilled water, 1 fl. oz. Kept in a perfectly filled airtight bottle. (No. 2) Potassium hydroxide 24 grains ; water, 1 fl. oz. ; kept as No. 1 ; magnesia, 30 grains. To be mixed immediately before administration. It is found that the administration of adrenine solution immediately after the ingestion of KCN, or other non-irritant poison, will arrest absorption for so long that it forms a most valuable means of gaining time for the use of appropriate antidotes. For this purpose 3 drachms of 1 : 1,000 of adrenine solution diluted in 3 ounces of water should be at once given. Then, in the case of cyanides, the above antidote ; then the stomach should be washed out ; finally, another dose of 1½ drachms of adrenine solution diluted with 2 ounces of water. Adrenine would probably be equally serviceable for arresting absorption in cases of poisoning with strychnine, aconitine and other alkaloids.

Digitalis, Active Principles, Biological Standardization of. C. Eggleston. (*Amer. J. Pharm.*, 1913, **85**, 99.) After comparing the 12 hour frog method of Houghton, the 1 hour frog method of Famulener and Lyons, the guinea-pig method of Reed and Vanderkleed, and the cat method of Hatcher and Brody, the author concludes that the last named is the only one which affords any evidence of relative therapeutic value of different members of the digitalis group. It can, however, only be regarded as the best at present available, for there is no perfect method of biologically standardizing these drugs.

The cat method of Hatcher possesses the greatest number of advantages. It is accurate to within 10 per cent. ; gives constant results from year to year ; provides a means of detecting the presence of deterioration ; is the least affected by adventitious factors ; tests the action of the drug upon which its therapeutic use depends ; is not too difficult for general use ; is neither too time consuming nor too costly ; by it widely different preparations can be compared accurately ; its results are transferable

to man ; it has the widest range of applicability of all the methods. Neither the frog nor the guinea-pig method fulfils so many of the essential requirements. The results obtained with frogs are not applicable to the human subject. (See also *Y.B.*, **1904,** 541 ; **1906,** 97 ; **1907,** 195 ; **1908,** 232 ; **1909,** 245 ; **1910,** 213 ; **1911,** 243 ; **1912,** 341, 437, 442, and *Gen. Index.*)

Digitalis, Distribution of Active Principles of and Preparation of the Infusion. S. Hirohashi. (*Apoth. Zeit.*, 1913, **28,** 133.) The activity of the upper leaves of foxglove is greater than that of the lower. It diminishes with the age of the leaves. To obtain the drug in its most active form the leaves should be gathered before the flower buds swell and the lower leaves should be rejected. The unexpanded flower buds are probably even more active than the leaves ; when in bloom, however, they are less active. No marked difference exists between the potency of red and white flowers. When the flowers are well preserved they keep their activity unimpaired for a year. The fruits are equal to the flowers in activity, but the stems are distinctly weaker.

The great part of the active principles of the leaves are extracted by a cold water infusion, if enough water be used. The infusion thus obtained does not materially lose strength by evaporation. (See also *Y.B.*, **1906,** 97 ; **1907,** 195 ; **1908,** 233 ; **1911,** 277, 243, 261 ; **1912,** 308, 341, 442, and *Gen. Index.*)

Drug Dosage for Children. W. J. Dilling. (*B.M.J.*, 1912, **2,** 1179.) After criticizing the formulae of Young, Cowling and Brunton, the author advocates the use of the following expressions : For the metric system $\frac{\text{Age} \times 5}{100}$; for the Imperial system $\frac{\text{Age.}}{20}$ These results correspond with the average age weights of both sexes.

Eosin, Erythrosin and Fluorescein Harmless. E. Rost. (*Apoth. Zeit.*, 1912, **27,** 582.) Pharmacological experiments show that eosin is quite without toxic action and even harmful effect when administered in relatively large quantity. What is absorbed is excreted unaltered. No splitting off of Br, with consequent formation of fluorescein, occurs. Erythrosin, the corresponding iodo-substitution product of fluorescein, is equally

stable and harmless. Fluorescein has even less pharmacological action than its bromo- and iodo-compounds.

Fungi, Haemolytic Action of. J. Parisot and — Vernier. (*Comptes rend.*, 1912, **155,** 620.) The juices of many fungi, both of those which are commonly regarded as edible, and of those which are poisonous, are powerfully haemolytic, both *in vivo* and *in vitro*. The juice of *Amanita phalloides*, extracted by macerating the crushed material with one half its weight of 9 : 1,000 NaCl solution, is intensely poisonous and most powerfully haemolytic. Less than 10 drops is sufficient to kill a rabbit in a few seconds, when injected into a vein. Although this is the most active, many other fungi are very powerful haemolysants. Of all the toxic fungi examined *Entoloma lividum* was the only one which had not this property. Heating the juice to 120°C. under pressure, and even simple boiling, either mitigates, or entirely destroys the haemolysing principle. But mere boiling of the whole fungi is not sufficient to destroy its toxicity; therefore, cooking does not render poisonous fungi fit for food. Even with those which are regarded as edible, the cooking should be thorough, and performed at a high temperature. For this reason, the presence of fat or oil has obvious value. Fresh extracted juice and young fresh fungi show less haemolysing action than staler or older material. For food, therefore, fungi should be freshly gathered. Stale or old specimens should be rejected. Since it is observed that generally before boiling the juices do not reduce Fehling's reagent, but do so afterwards, it is probable that the active haemolysing principle is glucosidal in its nature, as suggested by Ford, who named it, in the case of *Amanita phalloides*, *Amanita haemolysin*. Kobert has considered it to be a tox-albumin, which he called *Phallin*. It is found that when the haemolysing principle has been destroyed, the fungi, as a rule, but not invariably, become markedly less poisonous.

Iodine and Sodium Hyposulphite, Combined Use of, for Sterilization. L. Sabbatini. (*Gazz. Osped. Schweiz. Woch. Chem. Pharm.*, 1913, **51,** 119.) By following the application of tincture of iodine by that of solution of sodium hyposulphite, the staining of the skin, and the irritation caused by the iodine, may be avoided, while the antiseptic action is unimpaired. The area is first freely painted with a 1 : 10 alcoholic solution of iodine, and then covered with a sheet of sterile absorbent cotton. After

5 to 10 minutes, aqueous solution of sodium hyposulphite 1 : 20, previously sterilized, and then warmed to 40°C., is freely poured on to the dressing, so as to saturate it. The wet dressing is then gently squeezed over the iodine-painted area. In 2 minutes it may be taken off. The hypo itself is a mild antiseptic. This procedure is said to give perfectly satisfactory results without discomfort to the patient.

Iridin and Euonymin, Alleged Inactivity of. — Eichler and B. Latz. (*Nouveaux Remèdes*, 1912, **29**, 496.) Iridin is stated to be quite devoid of any useful activity. Euonymin, described by the authors as the "glucoside of *Euonymus atropurpureus*," is also stated not to stimulate the biliary secretion, but even to check it.

Lecithin, Influence of, on Action of Poisons. P. M. Lavrov. (*Zentrall. Biochem. Biophys.*, **12**, 556; *Chem. Abst. Amer. Chem. Soc.*, 1913, **7**, 167.) From experiments on frogs lecithin appears to exert a different action according to the amount present. Small quantities inhibit the action of poisons, larger quantities intensify it. Thus, the action of 0·000125 Gm. of strychnine is inhibited, for those reptiles, by 0·0025 Gm. of lecithin. It is strongly intensified by 0·02 Gm. The same was observed with curare. In the case of alcohol, an inhibiting effect was found with 0·8 Gm. of EtOH and 0·02 Gm. of lecithin. With 0·04 to 0·05 Gm. of lecithin the effect was intensified.

Phytin, Action of, on Phosphorus and Nitrogen Metabolism. — Gregorio and V. Santonoceto. (*Nouveaux Remèdes*, 1913, **30**, 7.) Phytin in doses of 1 to 2 Gm. per diem lessens markedly the elimination of P and of N in the excreta. It has a powerful action on the nutrition, and is, therefore, strongly indicated for the treatment of rachitis, scrofula, neurasthenia and other wasting diseases. (See also *Y.B.*, **1904**, 141.)

Pituitary Preparations, Pharmacological Standardization of. H. C. Hamilton. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 1117.) The value of pituitary gland preparations can only be determined by physiological experiment by observing the reaction on the blood-pressure of the dog. The amount of active principle found best for injection is that contained in 0·02 Gm. of fresh or in 0·001 Gm. of dry defatted material. This gives very nearly the same reaction as 0·00001 Gm. of adrenine. This

is taken as the standard. The solution for injection is prepared by rubbing down 0·1 Gm. with successive quantities of acidified water until 100 c.c. of solution is obtained. This is decanted or filtered free from sediment, and 1 c.c. is injected. The blood pressure readings of the preparation are compared with those of the standard—the potency of the former is adjusted accordingly.

Stimulant Narcotics, Historical Survey of. R. Stockman. (*Pharm. J.*, 1912 [4], **35,** 685.) Before discussing the chemical constituents of *Catha edulis* (see p. 217), the author here alludes to other stimulant narcotics, including the various forms of alcoholic beverages used by ancient or uncivilized tribes, *Paullinia sorbilis*, or guarana; *Piper methysticum*, or kava-kava; *Amanita muscaria*; and *Datura stramonium*.

Synthetic Remedies of the As Group. J. Grier. (*Pharm. J.*, 1913 [4], **36,** 440.) After alluding to phosphoric and glycerophosphoric acids the author deals with the various organic compounds of As used in medicine.

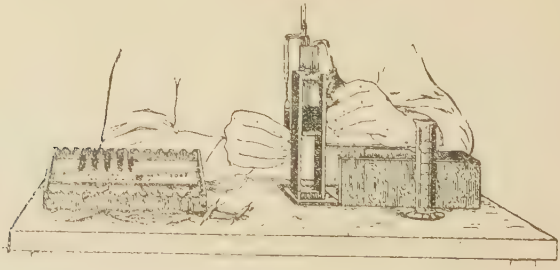
Yeast, Use of, in Therapeutics. M. Barsickow. (*Pharm. Zeit.*, 1913, **58,** 117.) A bibliographical review and compilation of references to the published papers on the use of yeast in medicine.

Zygadenus Intermedius, Physiological Action of, Some Constituents of the Leaves of. F. W. Heyl and F. E. Hepner. (*J. Amer. Chem. Soc.*, 1913, **35,** 803.) Since poisonous properties are attributed to the leaves of *Z. venenosus*, the resin of the nearly allied *Z. intermedius* has been physiologically examined. Given by the mouth to dogs it is inert. From the EtOH extract of the leaves, a quercitin, m.p. 317–318°C.; a crystalline alkaloid; an amorphous base; a trace of a sulphur compound; sucrose; a reducing sugar; dextrin; cerotic, linolic, oleic and isolinolenic; stearic and palmitic acids; a hydrocarbon probably hentriacontane, a polyhydric alcohol allied to ipuranol, and a new crystalline substance, m.p. 112–114°C., were isolated, besides amorphous unidentified resinous products.

PHARMACY

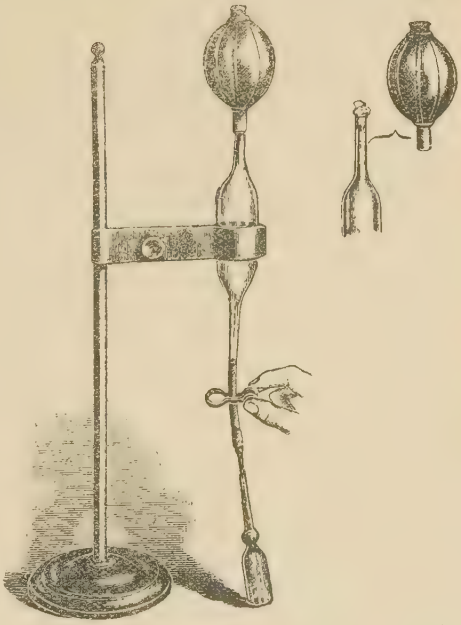
DISPENSING

Ampullae, Apparatus for Filling. (*Pharm. Zeit.*, 1912, **57**, 946.) The figure is self-explanatory. The reservoir flask is fitted with a rubber cork bearing three pieces of tubing. Two of these are similar to those of the ordinary wash bottle, and the third is used when required to fill the container by means of a narrow funnel. A fine platinum cannula is fused on to the end of the delivery tube, and is interted into the drawn out opening of the ampoule. Pressure is obtained by means of a collapsible hand bellows.



Ampullae, Apparatus for Filling with Sterile Liquids. — Stich. (*Apoth. Zeit.*, 1913, **28**, 348.) The liquid to be used is filled by means of a vacuum pump or suction, into a sterile glass cylinder, plugged at one end with wool and fitted at the other with sterile rubber and a pinch cock with a finely drawn-out glass delivery tube. A small pressure bag is then attached to the upper end, and the apparatus fitted to a clamp. In this way a number of ampullae can be rapidly filled. The apparatus is simple and

can be easily sterilized. It is therefore eminently suitable for use in the pharmacy.



Arrhenal, or Sodium Cacodylate, and Cherry Laurel Water, Incompatibility of. A. Labat. (*Bull. Soc. Pharm. Bordeaux: L'Union Pharm.*, 1913, **540,** 140.) A prescription calling for arrhenal, 0·5 Gm., cherry laurel water, 10 Gm., was found to give a solution which, although clear when first compounded, gradually became turbid and threw a deposit. A saturated aqueous solution of benzaldehyde in water behaved in a similar manner with arrhenal. It was found that the formation of the precipitate may be avoided by freely diluting the mixture with distilled water, adding sufficient to make the above quantities up to 125 Gm. Sodium cacodylate behaves in a similar way with cherry laurel water.

Calcium Hypophosphite and Ammonio-Citrate of Iron in Prescriptions. (*Chem. and Drugg.*, 1913, **82,** 607.) These are incompatible; a precipitate of calcium citrate, tinted with the iron, falls after a short time.

Cherry Laurel Water, Incompatibility of Alkalies. — Reddé. (*J. Pharm. Chim.*, 1913, **7,** 585.) Endeavouring to increase the stability of cherry laurel water by means of the addition of a little alkali, the author found the action to be the reverse of what was anticipated. Instead of preserving, the presence of greatly hastens decomposition; and a yellowish precipitate is quickly formed. This, however, does not contain

HCN. The cause of the incompatibility of arrhenal with the water, noted by Labat, is due to the alkalinity of that substance. It may be prevented by the addition of citric acid. In the case of arrhenal the amount used must be equal to half the weight of the arrhenal. Obviously this quantity cannot be used for hypodermic injections. If cherry laurel water be ordered as the vehicle for these it must be replaced by distilled water.

Copaiba Emulsions. — Hommell. (*Merck's Report; Drugg. Circ.*, 1913, **57,** 264.) *Emulsion of Copaiba.*—Copaiba, 45·0 c.c.; powdered extract of glycyrrhiza, 10·0 Gm.; powdered acacia, 40·0 Gm.; saccharin, 0·5 Gm.; oil of anise, 0·5 c.c.; cinnamon water, to make 250·0 c.c. *Emulsion of Copaiba with Iron.*—Copaiba, 45·0 c.c.; tincture of iron chloride, 22·5 c.c.; glycerin, 45·0 c.c.; saccharin, 0·5 Gm.; dextrin, 50·0 Gm.; camphor water to make 250·0 c.c.

Dispensing Hints. F. M. Apple. (*Drugg. Circ.*, 1912, **56,** 718.) *Dispensing Camphor or Menthol in Oil.*—It is recommended that these drugs should be dissolved in the oily vehicle in the vessel in which they are to be sent out, gentle heat being applied to promote solution. The rest of the oil is then added.

Filling Oils into Soft Capsules.—Imperfect sealing of gelatin capsules filled with oil often results from a small portion of oil coming in contact with the sealing lip. The tops of all capsules filled with oils should be carefully wiped with pellets of cotton moistened with $CHCl_3$. By taking this precaution subsequent leakage of oil may be prevented.

Cod-liver Oil Standards.—Standard or permanent bottles should never be kept on the pharmacy shelf for cod-liver oil, to be refilled when partly emptied. A small dry stock bottle should be filled directly from bulk and rejected when empty, a fresh dry bottle being taken for the next lot.

Dispensing Problems. (*Chem. and Drugg.*, 1913, **82,** 576.) *The Best Excipient.*—Pulv. opii, gr. ¾; ext. bellad, gr. ⅛; camphor, gr. j; ol. cajuput, ♏j; ext. gentian, q.s.; ft. pil, m.t. xxiv. A good result is obtained with a grain of yellow wax and powdered gentian. *A Solid Glycerol.*—Acid. salicylic, zinci oxidi, āā, ʒj; glycerini, ℥j; aq. ad, ℥iij—M. Solidification takes place owing to formation of zinc salicylate. *Precipitates Formed.*—(1) Calcii glycerophos, ʒj; liq. strychninae, ʒj; glycerini, ℥j; inf. gentian. ad, ℥vj—M. This produces a clear

mixture, but on keeping a deposit forms of calcium phosphate due to hydrolysis. (2) Sodii salicyl, sodii bicarb., āā. ʒij; aq. ad, ℥iv—S. Here sodium bicarbonate is "salted out" by the salicylate. *Difficult Lotions.*—(1) Ol. sesami, aq. calcis, āā, ℥iij; cret. praep., zinci oxid., āā, ʒiv; acid. salicylic., ʒj; ft. lotio. Ordinarily this makes a lump floating in water, but a cream is obtained by mixing the solids with the water, and incorporating this mixture with the ol. sesami. (2) Zinci oxidi, ʒiij; liq. plumbi subacet., liq. picis carbon, āā, ʒj; mucilag. acaciae, ʒij; aq. ad, ℥iv; ft. lotio. To make this presentable use tragacanth mucilage instead of acacia mucilage.

Guaiacum Tincture in Aqueous Mixtures. (*Amer. Drugg.*, 1913, **61,** 87.) The prescription, tinct. guaiac., ℥i; glycerin, ℥i; aquam ad., ℥iv, is best dispensed by adding the tincture of guaiacum to 25 grains powdered gum tragacanth in a dry bottle, shaking until thoroughly mixed, then adding the water in portions with continued shaking and finally the glycerin.

Incompatibility, Instances of. (*Evans' Journ.*, 1912 [2], 58.) Harmless Incompatibles.—Mainly addressed to the medical prescriber, many of the instances of incompatibility mentioned in the article are obvious to the pharmacist. Such are the prescribing of $BiNO_4$ with $NaHCO_3$; $CaCl_2$ with Na_2SO_4; spirit of nitrous ether with iodides, and other familiar examples. *Caffeine citrate* causes trouble from the ease with which it gives up its acid when dissolved in water. ℞. Caffeinae citratis, gr. 80; sodii salicylatis, gr. 160; syrupi tolut., ℥i; aquam chlorof. ad, ℥viii; misce, ft. mist. A light bulky precipitate of salicylic acid is thrown out by the liberated citric acid. If caffeine in half the amount (40 grains) be used, a clear mixture is obtained. The same remarks apply to the following injection for hypodermic use: ℞. Caffeinae citratis, gr. xx; sodii benzoatis, gr. xx; liq. strychninae, ♏xl; aquae destillatae, ad, ʒii; ft. injectio hypodermica. The precipitate in this case is benzoic acid. *Calcium glycerophosphate* ordered with sodium benzoate or cinnamate also gives a precipitate, but in the following the precipitate is not calcium cinnamate, but free cinnamic acid. ℞. Calcii glycerophosph., ʒii; sodii cinnamatis, gr. xx; acidi phosph. dil., ℥i; glycerini, ℥i; infusi aurantii co., ad, ℥iv. Misce, ft. mist. This precipitate is easily shaken up, and remains well suspended if dispensed properly. An old sample of *terebene* used in the following mixture gave rise to an unusual variety of iodine

liberation and coloration. ℞. Terebeni, ʒiii; pulv. tragac. comp., ʒii; potass. iodidi, gr. xlviii; syrupi tolutani, ℥i; aquae anisi, ad, ℥viii. Misce, ft. mist. The iodine liberated formed blue iodide of starch, with the starch in the compound tragacanth powder, and gave a most peculiar-looking product. Here an alkali prevents the reaction, and gives a passable mixture. *Phenazone* with salicylates may, or may not, give a deposit of insoluble antipyrine salicylate, depending on the other ingredients in the mixture. ℞. Phenazoni, ʒi; sodii salicylatis, ʒii; potassii bromidi, ʒiii; syrupi, ʒvi; infusi gent. co., ad, ℥vi. Misce, ft. mist. This mixture sooner or later gives the precipitate of phenazone salicylate, but if the bromide be left out there is practically no deposit. It would seem, therefore, as if the bromide "salted out" the insoluble salicylate. *Nitrites* such as spirit of nitre cause a green coloration of nitroso phenazone. *Salicylates* give a deep brown with spirits of nitre and nitrites. ℞. Sp. aetheris nitrosi, ʒiii; sodii salicylatis, ʒii; syrupi scillae, ʒvi; aquae camphorae ad, ℥vi. Misce, ft. mist. In this the colour will gradually turn to reddish brown unless $NaHCO_3$ be prescribed as well. *Aceto-salicylic acid* ordered with KI in a cachet caused the iodide to give off iodine, and the cachets, owing to their containing starch, assumed a blue to bluish-black colour from the iodide of starch produced: ℞. Aspirin, gr. x; potass. iodidi, gr. ii. Ft. cachet. The best procedure is to rub the two powders separately, with sufficient cacao butter to give a granular mixture, then to mix them and enclose in a gelatin cachet. *Sodium salicylate* with *quinine salts* gives a precipitate of quinine salicylate, and often if the mixture be acid, of salicylic acid itself.

Dangerous Incompatibles.—*Strychnine with Alkalies.*—In dispensing strychnine with alkalies it should be remembered that the solubility of the alkaloid in water is about 1 : 7,000. Consequently under ordinary conditions there is no danger of precipitation or crystallizing out of the toxic base, if the amount ordered does not exceed the equivalent of 10 minims of liquor strychninae in every fluid ounce. A large amount of spirit of chloroform should not be prescribed with alkaline strychnine mixtures, or the separating chloroform in which the alkaloid is soluble may be concentrated in the last dose. The following is a typical prescription of this dangerous nature: ℞. Sodii bicarbonats, ʒij; liq. strychninae, ♏60; tinct. calumbae, ʒvi; tinct. chloroform. co. B.P. 1885, ʒiij; aquam ad, ℥vi.

M.f.m. The danger alluded to above can only be met by the use of a suspending mucilage (of tragacanth) and directing the bottle to be shaken. The same remarks apply to *strychnine with bromides* and to strychnine with mercuric chloride. *Potassium iodide with ferric salts* should not be prescribed, as in the following: ℞. Tincturae ferri perchloridi, ʒiii; tinct. nucis vomicae, ʒiss; potass. iodidi, ʒii; glycerini, ʒvi; aquam menthae pip. ad, ℥vi. Misce, ft. mist. There is no way of preventing this liberation of iodine, and, therefore, if iron and an iodide are wanted together the ammonio-citrate of iron should be ordered. *Bromides with ferric chloride* give a deep red colour due to ferric bromide, but no dangerous setting free of bromine. ℞. Potass. bromidi, ʒii; tinct. ferri perchlor., ʒi; glycerini, ʒvi; aquam chlorof. ad, ℥vi. Misce, ft. mist. *Arsenate of soda* when prescribed with syrup of iodide of iron gives a greenish deposit of ferrous arsenate. ℞. Sodii arsenatis, gr. ii; syrupum ferri iodidi ad, ℥iv. Ft. mist. With a thick syrup the precipitate is well suspended, but if the syrup be diluted then this ferrous arsenate may well become a source of danger by the rapidity with which it falls to the bottom of the bottle. If the mixture be cleared with enough dilute hydrochloric acid to convert the arsenate into the acid arsenate which is soluble, a safer and certainly more sightly mixture is produced. In a simple mixture of the composition given below one would hardly expect to find a serious incompatibility: ℞. Sodii bicarbonatis, ʒiii; magnesiae calc., ʒii; syrupi zinigiberis, ʒvi; infusum calumbae ad, ℥vi. Misce, ft. mist. Yet this when it had been made for a time became highly caustic to the taste and the patient complained that it burnt the mouth. On examination it was proved that the oxide of magnesia (evidently a good, well-kept sample) had converted the bicarbonate of soda into caustic soda, and had itself been changed to magnesium carbonate. The amount of caustic soda capable of being formed from the bicarbonate of soda present was 85 grains—an obvio sly dangerous amount. The mixture intended was certainly one with carbonate of magnesia and not calcined magnesia as written. Ointments such as the following may be classed as dangerous under certain conditions: ℞. Unguenti iodi, ℥iss; ung. hydrarg. fort., ℥ss. Misce, ft. unguentum. This formed iodide of mercury which penetrated the skin so deeply that a severe blistering was caused, accompanied with considerable pain. A similar case is recorded in which mercurial ointment was first

rubbed into the skin, and several days afterwards the surface was painted with iodine paint.

Iodine and Phenol in Lotion. (*Chem. and Drugg.*, 1913, **82,** 607.) These substances when prescribed together, develop a characteristic and marked odour. In presence of alcohol, iodoform is formed. There is no means of preventing the development of the odour short of modifying the original formula.

Melubrine, Incompatibility of, with Cherry Laurel Water. —Tiffeneau. (*Répertoire*, 1913, **25,** 283.) When melubrine is dissolved in cherry laurel water it forms a crystalline compound, benzylidine-amino-pyrine, with the benzaldehyde present. In fact, aminopyrine and its methane sulphonic derivative melubrine form excellent precipitants for the determination of small quantities of the aromatic aldehydes. H. Hérissey states that phenylhydrazine may be used in the same way.

Methylene Blue and $HgCl_2$ Solution. T. Wilson. (*Pharm. J.*, 1913 [4], **36,** 99.) The following prescription was found to give an unsightly precipitate: Mercuric chloride, ʒj; methylene blue, gr. j; water, ℥vj. On standing, after the violet precipitate had subsided, the supernatant liquid was colourless. The object was evidently to colour the strong solution blue, so that when diluted to a 1 : 1,000 solution of $HgCl_2$ it would have a distinctive warning blue colour. Methylene blue is not suitable for the purpose. Experiments were made with other blue dyes. Those known by the trade names "Night blue" and "patent blue" were found to afford permanently clear blue solutions with strong $HgCl_2$ solutions. These dyes should therefore be used, and not methylene blue, for the purpose.

Notes and Queries in Dispensing. W. Duncan. (*Pharm. J.*, 1913 [4], **36,** 711.) Explanation was required of the effervescence occurring in the following mixture: Acid. borici, 44 drachms; zinci carb., 4 drachms; glycerin. pur., 2 oz.; aq. rosae, 6 oz. Ft. mist.

There is a formation of glycerylboric acid which liberates CO_2 from the $ZnCO_3$.

Great difficulty is found in turning out a good mass with the following: Pulv. opii, gr. ¾; ext. bellad., gr. ⅛; camphor, gr. i; ol. cajuput, ♏i; ext. gentian, q.s. Ft. pil., m.t. xxiv.

One grain of yellow wax and of powdered gentian give a good result.

Why does the following mixture become brown? ℞. Liq. strych. hydroc., 1½ drachms; acid. nitro-hydroch. dil., 4 drachms; aq. dest, ad 6 oz. Ft. mist.

The oxidizing action of the nitro-hydrochloric acid on the strychnine, especially if there be any trace of brucine, gives a yellow colour which may deepen to brown.

Why does the following go solid in the course of three days? ℞. Acid. salicylic., zinci oxidi, of each, 1 drachm; glycerini, 1 oz.; aq., ad 3 oz. Misce.

There is formation of zinc salicylate which is insoluble in glycerin.

Can the following be dispensed without precipitation? ℞. Liq. bismuthi, 6 drachms; acid nitro-mur. dil., 2 drachms; pepsenciae, 1½ oz.; aq. menth. pip., ad 6 oz. Ft. mist.

Bismuth citrate is precipitated owing to the neutralization of the ammonia of the Liquor Bismuthi by the nitro-hydrochloric acid. The precipitation cannot be avoided and is intended. The skill of the dispenser lies in securing a very finely divided precipitate which is found to be therapeutically more efficacious.

When dispensed the following is a clear mixture, but deposits on keeping. What is the deposit? ℞. Calcii glycerophosph., 1 drachm; liq. strychninae, 1 drachm; glycerini, 1 oz.; inf. gentian, ad 6 oz. Ft. mist.

Calcium glycerophosphate is often partially decomposed, and the watery solutions tend to hydrolyse, with precipitation of calcium phosphate.

Suggest an excipient for the following: ℞. Mangan. dioxid., ferri protochlor, of each, 2 gr.; acid arseniosi, $\frac{1}{30}$ gr.; aloin., gr. i; ext. nucis vom., ½ gr. Ft. pil. m.t. xxx.

Woolfat gives the best results.

What is the precipitate which invariably forms in the following mixture? ℞. Sodii salicyl., sodii bicarb., of each, 2 drachms; aq., ad 4 oz. Solve.

The precipitate is sodium bicarbonate salted out by the sodium salicylate.

A more rapid method for preparing lin. terebinth in large volumes is required. This may be met by dissolving the camphor in the turpentine and the soap in boiling water and shaking well.

The following resolves itself into a solid lump floating in water. How may it be made more presentable? ℞. Ol. sesami, aq. calcis, of each, 3 oz.; cret. prep., zinci oxid., of each, 4 drachms; acid salicylic, 1 drachm. Ft. lotio.

Treat the chalk and zinc oxide with the salicylic acid and the lime water so as to destroy the acidity of the acid, and then mix with the sesame oil.

How would you dispense the following? ℞. Ferri bromidi, gr. i. Ft. pil., m.t. 50.

Adopt the 1885 B.P. method for pil. ferri iodidi. Make the ferrous bromide from iron wire and bromine, and mass with licorice and gum, and varnish the pills.

How can the following be made presentable? ℞. Zinci oxidi, 3 drachms; liq. plumbi subacet., liq. picis carbon., of each, 1 drachm; mucilag. acaciae, 2 drachms; aq., ad 4 oz. Ft. lotio.

By substituting tragacanth for acacia mucilage a much better product is obtained.

What happens in the following? ℞. Acid. hydroch. dil., 2 drachms; sol. Fowleri. ½ drachm; gly. acid carbolic, 1½ drachms; spt. chlorof., tinct. card. co., of each, 2 drachms; sol. potass. chlorat. (1 in 20), ad 6 ozs. Sig.—Use a dessertspoonful as a gargle, and swallow afterwards.

Probably the potassium chlorate and the hydrochloric acid react with liberation of chloric acid, which bleaches the colour of the cochineal in the tincture of cardamoms.

How should the following be dispensed? ℞. Liq. arsenic. hyd., liq. strychnin, of each, 1 drachm; liq. ferri perchlor, 2 drachms; ext. glycyrrh., liq., 1½ ozs.; aq., ad 6 oz. Ft. mist.

By adding about 1 grain of tragacanth to each ounce a passable mixture is obtained.

The following suppositories are difficult to remove from the mould and apt to split. How can this be remedied? ℞. Quin. hydrochlor., grs. 4. Ft. sup., m.t. vi.

In turning out suppositories there are three factors: (1) The nature of the suppository; (2) the lubricant, and (3) the dispenser. As a lubricant lin. saponis is now a favourite, but almond oil is to be preferred. Much cleaner suppositories are obtained by using almond oil. The heating of the mass needs care, and pouring just at the right temperature is equally important. In this way no trouble should arise.

Oily Substances, Dispensing. J. L. Lascoff. (*J. Amer. Pharm. Assoc.*, 1913, **2**, 476.) The author deals first with the hydrocarbon oils, which may be prescribed under such trade names as "Albolene," "Benzonol," "Glymol," "Mineral Glycer-

in," "Glycolene," "Russian Mineral Oil." Also such compound or coloured preparations as "Rubrol," "Viridol," and sprays as "Sabolol" and "Pinoleum" are met with in American practice. The following are typical prescriptions: (1) Camphor, ½ grain; menthol, ½ grain; glycerin, 2 drachms; sodium bicarbonate, 3 grains; liquid albolene, to make ½ oz. M. Sig. Ear drops. In order to make a uniform mixture the camphor and menthol are dissolved in a little of the albolene, with gentle heat. The bicarbonate is similarly dissolved, separately, in the glycerin. A little anhydrous lanoline is then used to produce a uniform suspension. (2) Resorcini, 0·5; albolini, 50·0. M. Sig. Drop into ear as directed. As resorcin is not soluble in albolene, or by heat, it is dissolved in a very small amount of alcohol, rubbing slowly in a mortar and the required amount of the albolene is added. A clear mixture results. (3) Resorcini, 0·3; mentholis, 0·2; albolini, 30·0. M. Sig. Ear drops. In this case dissolve the menthol in the albolene by slow heating. Dissolve the resorcin as in the previous prescription and then mix. (4) Cocaini hydrochloridi, 0·2; sol. adrenalini hydroch. 6·0; mentholis, 0·1; liq. petrolat. q.s. ad, 30·0. The adrenaline solution is not miscible with mineral oils, therefore use the adrenaline inhalant, which is an oily solution of some strength and dissolves easily in the oil. Instead of the salt of cocaine use the alkaloid which is soluble in liquid petrolatum by heat. Put the menthol into the bottle while the liquid petrolatum is still warm; it will then dissolve and the mixture be clear. (5) Mercury salicylate in albolin, 20 per cent. Sig. To be used for injection. Mercury salicylate is not soluble in albolene nor does it remain in stable suspension for any length of time. The precipitate is thick, heavy and very difficult to agitate The mercury salicylate must be suspended in the albolene by the addition of one-half per cent. of anhydrous lanolin. (6) Tr. benzoini co., 1 drachm; eucalyptolis, 10 ♏; benzoinolis liq. q.s., 1 oz. Spray throat. If this prescription is compounded as written the benzoinol separates from the entire mixture. Rub the tr. benzoin co. with a little lanolin and one-half the quantity of benzoinol. Apply a little heat to dissolve, add the eucalyptol and the balance of the benzoinol and the result is perfect. (7) Quinine and urea hydrochlor., 0·6; hydrarg. salicylat. 3·0; adepis lanae (anhydrous), 1·0; ol. olivarum, 30·0. Dissolve the quinine and urea in a few drops of water, emulsifying with the lanolin, then adding the mercury salicylate. Then rub

well with the olive oil. Care must be taken that this preparation is thoroughly sterilized. (8) Euresolis (Knoll), 3·0; calamini praep, 6·0; zinci oxidi, 9·0; amyli, 12·0; ol. olivar, 15·0. Magnesiae lactis (Phillips) (quantity not given). Saponify olive oil and euresol with the milk of magnesia. Rub with starch, zinc oxide and calamini, then q.s. rose water. (9) Camphorae, 0·2; mentholis, 3·0; ol. pini pumilionis, 2·0; milk magnesia q.s. ad, 60·0. Rub up the camphor in a glass mortar with the menthol and ol. pini pumilionis, then saponify with the milk of magnesia; it will form a uniform suspension. (10) Ext. aloes, $\frac{1}{2}$ gr.; podophyllini, $\frac{1}{4}$ gr.; cascarini, $\frac{1}{4}$ gr.; ol. carui, 1 ♏. D.t.d. Pill No. 24. Emulsify the oil with a little acacia and then add the other ingredients. (11) Nitroglycerini, $\frac{1}{100}$ gr.; extr. nuc. vom., $\frac{1}{8}$ gr.; ext. digitalis fl., 1 ♏; zinci valerianici, 3 gr.; ol. menthæ. pip, 3 gr. M.f.D.t.d. Capsules No. 30. The peppermint oil is suspended with a little acacia, adding the other ingredients, and massing with licorice extract. (12) Methylene blue, 0·2; phenyl salicylate, 0·3; sandalwood oil, 0·4. M.f.D.t.d. Capsules No 30. Dissolve the phenyl salicylate in the sandalwood oil with heat. Rub down the methylene blue with a little milk sugar, put in each of the 30 capsules. Add the sandal oil solution in the appropriate quantity to each capsule by means of a dropper. Seal and enclose in a larger capsule. (13) Oil of wintergreen, 2 drachms; oil of turpentine, 2 oz.; alcohol to make 4 oz. Add the winter green oil to the alcohol, and add this solution, gradually, to the turpentine.

Ophthalmic Prescriptions. (*Prescriber*, 1913, **7,** 200.) *Iodine for Corneal Ulcers.*—Meierhof recommends instillation of an aqueous solution of iodine in corneal ulcers. Such a solution causes only slight pain, which passes off in 10 or 15 minutes: Iodi, gr. i; sod. iodid., gr. iii; aq. destil., ℥i. Solve. Sig.—"Three drops to be instilled into the eye 3 or 4 times daily."

Foreign Bodies in the Eye.—According to Pron the instillation of 1 drop of the following solution will reveal the presence of a foreign body in the eye by a yellow coloration at the point of contact: Fluorescein, 0·01 Gm.; sodium carbonate, 0·07 Gm.; sterile distilled water, 2 c.c.

Atropine Ointment.—Hart finds that atropine alkaloid is not as soluble in soft paraffin as the sulphate. He recommends the following formula for ophthalmic use: Atropine sulphate, 1; glycerin of acacia, 1·5. Mix and add: Cerated soft paraffin,

25 ; soft paraffin, 72·5. Glycerin of acacia consists of mucilage of acacia prepared with equal weights of gum and chloroform water, and diluted with half its weight of glycerin. Cerated soft paraffin is prepared with 1 part of yellow beeswax and 14 parts of soft paraffin.

Cocaine in Eye Ointment.—An eye ointment of the following composition is reported by Wyatt to have proved extremely irritating: Hyd. ox. flav., gr. ii ; cocainae hydrochl., gr. ii ; acidi borici, gr. iv ; vaselini flavi, ʒiv. On the assumption that the irritation might be caused by formation of traces of HCl_2, cocaine alkaloid dissolved in castor oil was substituted for the hydrochloride. There was no further irritation.

Isotonic Eye Lotions.—In order to yield the best results, an eye lotion, says Cantonnet, should be isotonic with the lachrymal secretion. This tonicity is represented by a solution of NaCl of 1·4 per cent. strength. A 1 per cent. solution of cocaine hydrochloride should contain 1·25 per cent. of NaCl. Sodium chloride should not be added to lotions containing $ZnSO_4$ or $AgNO_3$.

Iodine Eye Ointment.—Dewaele recommends the following ointment as a disinfectant of the cornea, especially after the extraction of foreign bodies : Stovain, gr. $2\frac{1}{4}$; adip. lanae hydr., gr. lxxv ; paraff. moll., ʒiiss. Mix in a water-bath and add gradually the following solution : Iodi., gr. $2\frac{1}{4}$; sod. iodid., gr. ivss ; aq., ♏xxiv.

Paraldehyde and Iodine in Mixture. (*Chem. and Drugg.*, 1913, **82,** 607.) In the following prescription : Paraldehyde, 4 drachms ; potassium iodide, 1 drachm ; potassium tincture of squill, $1\frac{1}{2}$ drachms ; syrup, 1 oz. ; carbonate, 4 grains ; water to make 8 oz., iodine was liberated. This is due to acidity of the paraldehyde, which is frequently acid. Enough K_2CO_3 should be added to make the mixture distinctly alkaline.

Phenazone, Sodium Salicylate, and Magnesium Sulphate, Incompatibility of. H. Finnemore and J. A. Colverd. (*Pharm. J.*, 1913 [4], **36,** 762.) The incompatibility of these chemicals has been known for some years, but no definite conclusion as to the nature of the crystalline substance formed has been published.

The original mixture contained these ingredients in the following proportions : Phenazone, 60 grains ; sodium salicylate, 180 grains ; magnesium sulphate, 480 grains. Water to 8 fluid oz. When these were mixed together and allowed to stand, a crystal-

line deposit formed in the course of a few hours. This was filtered off, washed with cold water till free from sulphate, a portion of it was dried, and was found to contain 3·5 per cent. of magnesium, 40·1 per cent. of salicylic acid, and 55·0 per cent. of phenazone. It melted with decomposition about 138°C. The remainder was recrystallized from boiling water, but its melting-point and composition were found to be unaltered by this treatment. This substance agrees in composition and properties with a double compound of magnesium salicylate and phenazone, containing two molecules of the latter and one of magnesium salicylate. Such a substance has already been prepared by Schuyten, in 1898 (*Chem. Zentralb.*, 1898, **2**, 888), by mixing together a solution of its components and leaving it to evaporate over sulphuric acid. The same writer has shown that the reaction is a fairly general one, and that a similar compound can be obtained from most of the metals by the condensation of the salicylate with phenazone.

Magnesium salicylate was prepared by the addition of excess of magnesium carbonate to a solution of salicylic acid in hot water. The excess of magnesium carbonate was filtered off, and phenazone was added to the filtrate. In the course of a few minutes, depending on the concentration of the solution, a crystalline compound was formed which was identical in properties and composition with the product obtained from the mixture. Altering the amount of the reacting bodies, we did not succeed in producing any variation in the composition of the product.

Magnesium phenazone salicylate is a white substance fairly soluble in hot water, sparingly soluble in cold. The solution in water exhibits a bluish fluorescence, similar to, but fainter than, that of a solution of a salt of quinine. The solubility of the substance is of importance to the pharmacist, and experiments showed this to be as follows:—

Saturated at 19·5°C. 100 c.c. contained 3·1 Gm. of phenazone magnesium salicylate. Saturated at 27°C. 100 c.c. contained 3·4 Gm. of phenazone magnesium salicylate.

Moreover, the solubility is lessened by the presence in the solution of much magnesium sulphate.

Prepared in the manner described by Schuyten, magnesium phenazone salicylate contains two molecules of water of crystallization; when prepared by the methods described above, the compound is anhydrous.

The practical point arises as to whether this precipitation can be prevented; for although the compound formed is probably not poisonous, and would, doubtless, possess the medicinal properties of its ingredients; yet the withdrawal of this amount of active substance from the mixture and its deposition on the sides of the bottle as a solid cake may be somewhat disconcerting to both the prescriber and the patient, and even to the pharmacist. The corresponding sodium salt, sodium phenazone salicylate, if formed at all, is apparently extremely soluble, and if pharmacists are consulted on the subject they are recommended to advise the medical practitioner to order sodium sulphate instead of the magnesium sulphate present in the original mixture.

Prescribing and Dispensing Errors, Administrative Safeguards for their Prevention. (*Lancet*, 1913, **184**, 1490.) The pharmacist is frequently confronted by an unusually high dose in a prescription, and in the absence of any definite rules regulating his line of conduct in such cases his position may be most embarrassing. The pharmacopœias of most foreign countries contain a table of maximum doses, in which the maximum single, as well as daily, dose (i.e., total amount administered during 24 hours) of the official potent drugs and preparations is laid down. These doses do not represent the limit; they merely indicate the maximum therapeutic dose in usual employment, and the prescriber is naturally at liberty to exceed these if he sees fit. The object of these tables, however, is to impress the practitioner with the necessity for caution in overstepping the established maximum dose, and, on the other hand, to enable the pharmacist to exert a certain control regarding the dosage of potent drugs.

In the majority of cases the medical man who wishes to prescribe a larger dose than the official maximum amount denotes that this is his intention by adding a note of admiration (!) after the amount in the prescription. This is required in Austria, Germany, Hungary, Russia, Japan, Holland and Switzerland; in Belgium either a note of admiration may be used, or the amount must be underlined; Hungary, as an extra precaution, demands that the amount shall be written out in full as well as the addition of a note of admiration; while Italy does not require a note of admiration, but the amount must be written in words and not stated in numbers.

France does not possess a table of maximum doses with the

same official character as have those of other countries. The last edition of the French Codex contains a list of maximum usual therapeutic doses, but it is distinctly stated that these are merely informatory and not binding on the prescriber. However, in overstepping these, to denote that such is his intention, the medical practitioner is advised to add the words "je dis. . . ."

In all Continental countries, if the pharmacist finds that the amount of a potent drug prescribed is in excess of the maximum dose and the medical attendant has omitted to add a note of admiration after the amount, or if he has reason to assume that the prescription contains an error, he is required to draw the prescriber's attention to the omission or supposed error; if he cannot do so orally he must communicate with the prescriber by means of a closed letter. If the medical practitioner insists upon the prescription being dispensed as written the pharmacist may do so under the practitioner's responsibility, but he must at the same time inform in writing the district medical officer of the facts, or if the latter is the prescriber of the debatable prescription he must report the matter to the provincial government, who submits it to the medical council.

In the case of a prescription calling for an amount of a potent drug in excess of the maximum drug, where the pharmacist cannot communicate with the prescriber, the former must reduce the amount to that of the maximum dose (in some German States to half the maximum dose), informing the medical practitioner in writing of the fact.

When confronted by an unusually high dose of a potent drug, or by a mistake in a prescription, the Italian pharmacist is required to demand the authorization in writing from the medical man to dispense the medicine, and the purpose for which it is intended must also be stated.

The maximum single and daily doses of a few potent drugs in a number of pharmacopœias are reproduced in the accompanying table (p. 317). These doses refer to internal administration, but in Germany, Holland and Switzerland they also apply to medicines administered in the form of hypodermic injections, enemata, and suppositories; in Germany they even apply to eye lotions and inhalations, and in Holland also to injections into the urogenital apparatus.

Special reference to decreasing the maximum dose for children is made in the Belgian pharmacopœia, while the Russian pharmacopœia states that the maximum doses given for adults in

Some Official Maximum Doses of Foreign Pharmacopœias (Amounts in Grains or Minims).

(B.P. doses given in brackets.)	Austria.		Belgium.		Denmark.		France.		Germany.		Holland.		Hungary.		Italy.		Japan.		Russia.		Switzerland.	
	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.
Acetanilid (1 to 3 grs.)	$7\frac{1}{2}$	30	—	—	$7\frac{1}{2}$	30	5	24	$7\frac{1}{2}$	24	$7\frac{1}{2}$	30	$7\frac{1}{2}$	24	—	—	$7\frac{1}{2}$	24	$7\frac{1}{2}$	30	$7\frac{1}{2}$	24
Acid. arsenios. ($\frac{1}{60}$ to $\frac{1}{15}$ gr.)	$\frac{1}{12}$	$\frac{1}{3}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{3}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{20}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{4}$
Atropin. sulph ($\frac{1}{200}$ to $\frac{1}{100}$ gr.)	$\frac{1}{64}$	$\frac{1}{30}$	$\frac{1}{64}$	$\frac{1}{32}$	$\frac{1}{64}$	$\frac{1}{15}$	$\frac{1}{64}$	$\frac{1}{32}$	$\frac{1}{64}$	$\frac{1}{30}$	$\frac{1}{64}$	$\frac{1}{20}$	$\frac{1}{64}$	$\frac{1}{20}$	$\frac{1}{64}$	$\frac{1}{25}$	$\frac{1}{64}$	$\frac{1}{25}$	$\frac{1}{64}$	$\frac{1}{20}$	$\frac{1}{64}$	$\frac{1}{20}$
Cocain. hydrochl. ($\frac{1}{20}$ to $\frac{1}{2}$ gr.)	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{3}{4}$	$2\frac{1}{2}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{1}{2}$	$2\frac{1}{3}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{1}{2}$	2	$\frac{1}{2}$	1
Codein. phosph. ($\frac{1}{4}$ to 2 grs.)	—	—	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{6}$	5	$1\frac{1}{2}$	5	—	—	—	—	—	—	—	—	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5
Extr. belladonn. ($\frac{1}{4}$ to 1 gr.)	$\frac{3}{4}$	3	$\frac{3}{4}$	$1\frac{1}{2}$	$\frac{3}{4}$	3	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{1}{3}$	$1\frac{1}{4}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{4}$	$2\frac{1}{3}$	—	—	$\frac{1}{2}$	3	$\frac{3}{4}$	$2\frac{1}{3}$
Fol. digital. ($\frac{1}{4}$ to 2 grs.)	3	9	3	9	3	15	3	15	3	15	$2\frac{1}{3}$	$7\frac{1}{2}$	3	15	3	15	3	15	$1\frac{1}{2}$	12	3	15
Hexamethylenetetramine	—	—	—	—	—	—	—	—	15	45	—	—	—	—	—	—	—	—	—	—	—	—
Morphin. hydrochl. ($\frac{1}{8}$ to $\frac{1}{2}$ gr.)	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{3}$	$1\frac{1}{4}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{3}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$
Opium ($\frac{1}{2}$ to 2 grs.)	$2\frac{1}{3}$	$7\frac{1}{2}$	$2\frac{1}{3}$	$7\frac{1}{2}$	$2\frac{1}{3}$	9	3	9	$2\frac{1}{2}$	$7\frac{1}{2}$	6	$2\frac{1}{3}$	$7\frac{1}{2}$	$1\frac{1}{2}$	$7\frac{1}{2}$	$7\frac{1}{2}$	$2\frac{1}{3}$	$7\frac{1}{2}$	$2\frac{1}{3}$	$7\frac{1}{2}$	$2\frac{1}{3}$	$7\frac{1}{2}$
Phenacetin (5 to 10 grs.)	15	45	—	—	15	60	15	45	15	45	$7\frac{1}{2}$	30	15	45	$7\frac{1}{2}$	45	15	45	15	60	15	45
Santonin (2 to 5 grs.)	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	5	$1\frac{1}{2}$	6	$1\frac{1}{2}$	5
Strychnin. nitr.	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{15}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{6}$	—	—	$\frac{1}{15}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{15}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{20}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$
Theobromin-sodium salicyl.	15	90	15	45	—	—	—	—	15	90	15	75	15	120	15	90	—	—	15	90	15	90
Tinct. opii (20 to 30 min.)	25	90	25	90	25	100	34	100	25	90	17	70	25	90	25	90	25	90	10	40	25	90
*Tinct. strophanth. (5 to 15 min.)	8	30	8	25	4	15	3	10	8	25	8	35	8	35	8	25	8	25	8	25	8	25

* The B.P. preparation is only 1 : 40, that of other pharmacopœias is 1 in 10. S. and D. — Single and Daily.

the table must be decreased for children in the following proportions :—

For children up to 1 year, $\frac{1}{20}$ to $\frac{1}{10}$; for children of 2 to 3 years, $\frac{1}{8}$; for children of 4 to 5 years, $\frac{1}{6}$; for children of 6 to 8 years, $\frac{1}{4}$; for children of 9 to 11 years, $\frac{1}{3}$; for children of 12 to 15 years, $\frac{1}{2}$; for persons of 16 to 19 years, $\frac{3}{4}$. Over 20 years of age the full maximum doses are applicable.

From the above it is clear that the provision of a safeguard for prescriber and dispenser in the shape of an official table of maximum doses, with fixed rules regulating its application in practice, is advantageous to all concerned. The forthcoming publication of a new edition of the B.P. offers an opportunity to incorporate in the volume a table of maximum doses suitable to British conditions, while the General Medical Council and Pharmaceutical Society might jointly elaborate a set of rules to be observed in special circumstances.

Prescriptions, Unusual. H. A. B. Dunning. (*Drugg. Circ.*, 1913, **57,** 249.) (1) Pulv. ferri sulph., ʒss; pulv. ext. nucis vom., gr. vi; acid. arsenios, $\frac{1}{40}$ grain in each capsule; pulv. pepsinae (scales), ʒss. M. ft. Caps. No. xxx. An equivalent proportion of anhydrous $FeSO_4$ was used, and the difference in weight made up with milk sugar. (2) Hexamethylaminae. ʒiij; potass. acet, ℥j; spt. ether. nit., ℥j; digitalin. German, 1 grain; strychnin. sulph., ½ grain. Elixir aromat. ad. ℥iv. This is incompatible; considerable odour of ethyl nitrite is evolved. (3) Sodii bicarb, ʒviiss; sodii sulphat., ʒv; sodii phosphat., ℥v; calcii lactat. ℥iiss. M. Ft. pulv. No. xx. Sig.—Pulv. t. i. d., p. c. in aq. Equivalent quantities of dried Na_2SO_4 and dried Na_2HPO_4 were used in place of the crystalline salts. (4) Tr. nuc. vom. ʒijss; ac. carbol., tr. iodin., āā, ʒss; aquae, q.s. ad ℥iv. M. Sig.—ʒj t. i. d., p. c. in H_2O. Incompatibility exists between tincture of iodine and the alkaloids contained in tincture of nux vomica, an insoluble iodide being formed. One oz. of alcohol used to replace 1 oz. of water effects solution. On standing, it may change colour, due to the combination of iodine with phenol. (5) Creosot, ♏xxx; codein, gr. vj; ol. oliv., q.s. Ft. caps. s. e. No. xxx. Powdered codeine alkaloid is dissolved in creosote by warming the mixture slightly; this solution is then mixed with enough olive oil to make 150 minims and the resultant solution is dispensed in thirty 5-minims soft elastic capsules. (6) Syr. ferri

iodi, ℥j; ol. cinnamom, gtt. ij; hydrarg. protoiod, gr. iv; syr. simp, ℥ss; aquae, q.s. ad ℥iij. M. Sig.—A teaspoonful in water 4 times daily. In this prescription incompatibility occurs between the iodide of iron and the protoiodide of mercury. Soluble iodides act upon protoiodide of mercury, producing the relatively more toxic mercuric iodide. The physician, when consulted, admitted that he desired the mercurous salt as prescribed, not the mercuric compound, which would be formed, and reduced the quantity of protoiodide of mercury to 1 grain. This was dissolved in a little water containing 5 grains of KI, and this solution was mixed with water and syrup, and finally with the syrup of iodide of iron. (7) Quin. sulph., apiol (fluid), ergotin, ext. gossypii pulv., ext. helleb. nig., ol. sabin., āā, gr. xxx. M. Ft. cap. No. xxx. Mix all of the powders with 80 grains of licorice, make a firm mass with the ergotin, and divide into thirty small masses of equal size. Mix the oily fluids and introduce them into thirty number 5 gelatin capsules. Press the capsule masses flat and shape each one around an oil-filled capsule in such manner as entirely to cover the same, then place it in a number 0 gelatin capsule.

Prescriptions, Unusual American. R. A. Newton. (*Drugg. Circ.*, 1913, **57,** 58.) (1) ℞. Ol. sabinae, ʒj; ol. rutae, ʒj; tr. polygon. hydropiper, ℥j; ol. amygdal. express, mucil acacae, aquae menth. pip, āā, ℥ij. Sig.—ʒj three times daily. To form an emulsion: 90 grs. of powdered acacia is placed in a mortar; the oils are added, then 3 drachms of water, and these are triturated to form a "primary." An equivalent of fluid extract of polygonum instead of the tincture is used, and peppermint water and water added to make 2 oz. (2) ℞. Sodii brom., ʒiij; sodii iod., ʒiij; fl. ext. euphorbiae, ʒiij; spt. glonoin, ♏xxv; tr. lobeliae, ʒiij. M. Ft. pil. No. 60. Sig.—One 4 times daily, before or after meals, and at bedtime. This is a modification of Hare's asthma remedy—not often exhibited in pill form. The tincture and the fluid extract are evaporated to an extract on a water-bath, triturated with the other ingredients, and enough powdered acacia added to mass. It is necessary to use a generous amount of lycopodium as a dusting powder to prevent absorption of moisture. (3) ℞. Tr. iodin, collodii, aq. ammon., āā, ℥j. Sig.—Apply 3 or 4 times a day. This prescription, seemingly incompatible, has been filled

many times as it is written. The prescriber did not wish any changes made in it. When first mixed the collodion is coagulated and the mixture is dark, but on standing the coagulum is dissolved and a light-coloured liquid is produced. ℞. Tincturae nucis vomicae, 10; tincturae strophanthi, 4; strontii bromidi, 6; sodii bicarbonatis, 4; tincturae gentianae comp., 80; aquae, q.s. ad 120. M. Sig. — One teaspoonful before meals, in water. Although there is no serious incompatibility, the $SrBr_2$ and $NaHCO_3$ react, liberating much CO_2 and forming a precipitate of $SrCO_3$. This reaction should be completed in an open vessel.

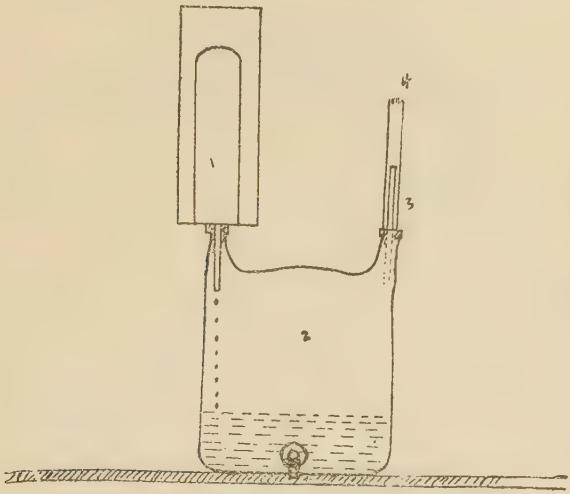
Salol, Incompatibility of. I. Bellucci. (*Atti R. Accad. dei Lincei, Roma*, 1912, **21,** 610; *J.S.C.I.*, 1913, **32,** 108.) The author has examined, by the method of thermal analysis, mixtures of salol with β-naphthol, antipyrine, urethane, menthol, chloral hydrate, thymol, and guaiacol, and finds that in all these cases the softening is due not to the formation of a chemical compound but to that of an eutectic mixture. The melting points and percentages of salol in the eutectic mixtures of salol with the substances mentioned above and with camphor and camphor bromide are as follows: with β-naphthol, 34°C., 90 per cent.; with antipyrine, 30°C., 83 per cent.; with urethane, 29°C., 86 per cent.; with menthol, 28°C., 45 per cent.; with camphor bromide, 21°C., 64 per cent.; with chloral hydrate, 17°C., 61 per cent.; with thymol, 13°C., 66 per cent.; with camphor, 6°C., 56 per cent.; with guaiacol, 3°C., 53 per cent. Salol and menthol form a continuous series of solid solutions.

Sera and Toxins, Apparatus for the Rapid Filtration of. F. M. Turner. (*Drugg. Circ.*, 1913, **57,** 9.) In the filtration of sera, autogenous toxins and solutions intended for intravenous and hypodermic use the greatest care must be taken. The presence of even the smallest particles in the finished solution is attended by great danger.

In the preparation of vanadium solution for intravenous use, even when the finest qualities of filter paper procurable are used, small particles of fibre in the finished product are detectable by the microscope. The apparatus illustrated filters at the rate of a litre per minute and gives a perfect filtrate, practically free from germs.

In the cylindrical jar with a small opening at the bottom is

an unglazed porcelain filter which is rendered tight by a rubber gasket secured by a screw. The tube passes through a rubber stopper into a Woulff bottle. The other tubulure of the bottle is connected to a vacuum pump, and this causes rapid and perfect filtration.



FILTERING APPARATUS AS SET UP.

1. Unglazed porcelain filter.
2. Woulff bottle.
3. Small glass tube through rubber stopper.
4. Pipe to connect with vacuum appliance.
5. Tubulure for drawing off filtrate.

Silver Nitrate Pills, with White Bole and Glycerin. H. Franck. (*Apoth. Zeit.*, 1913, **28**, 232.) In order to prepare stable and satisfactory pills of $AgNO_3$ it is absolutely necessary that the kaolin or white bole used to mass them be pure. Ordinary commercial white bole is not satisfactory. It must be purified by digesting 2 parts with a mixture of HNO_3 1 part and water 2 parts, washing by decantation until acid free and drying. This is then used as the basis with which the $AgNO_3$ is rubbed down. It should be massed with a mixture of glycerin, 3, and water, 1. The pills should be dried when rolled, in the dark, over H_2SO_4 in a desiccator, and should be stored in the dark in amber bottles. French chalk used to dust them must be chemi-

cally purified. The fingers may be protected while handling these pills by coating them with a thin layer of collodion.

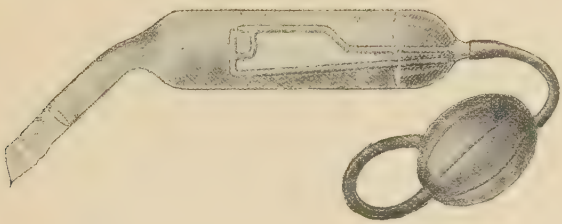
Sodium Acid Phosphate and Urotropine, Incompatibility of. D. F. Ritchie. (*Pharm. J.*, 1913 [4], **35**, 478.) The following prescription has given trouble: "Sodium acid phosphate, ℥iss; urotropine, ʒj; water to ℥xij. One oz. to be added to a pint of water and taken during the day." This gave a mixture varying in taste and which after keeping could not be used. Decomposition of the urotropine occurs. The sodium acid phosphate is partially neutralized and ammonium phosphate formed.

Sodium Cinnamate, Commercial, Alkaline, Cause of Apparent Incompatibility. P. Lemaire. (*Répertoire*, 1912, **24**, 341.) Commercial sodium cinnamate is often distinctly alkaline to phenolphthalein. In dispensing this alkalinity may give rise to trouble, as with the following prescription for eye drops: Sodium cinnamate, 0·10 Gm.; stovaine, 0·10 Gm.; distilled water to 10 Gm. This was found to give either oily resinoid droplets, or a white precipitate. The cause was traced to the alkaline reaction of the cinnamate. When an exactly neutral salt was used, a perfectly clear solution was obtained.

Sodium Phosphate, Sodium Glycerophosphate, and Sodium Cacodylate, Incompatibility of, with Strychnine Sulphate. — Salvert. (*Bull. Soc. Pharm. Bordeaux*, Dec., 1912; *Répertoire Pharm.*, 1913, **25**, 167.) The following injection is sometimes prescribed: Sodium phosphate, 1 Gm.; sodium cacodylate, 1 Gm.; strychnine sulphate, 10 Mgm.; distilled water, 10 Gm. On sterilizing this a flocculent precipitate is often formed. This is due to the action of the sodium phosphate on the glass. If a good glass container is used the amount of precipitate formed will be negligible.

Another injection presents a case of true and dangerous incompatibility: Sodium glycerophosphate, 1 gm.; sodium cacodylate, 1 Gm.; strychnine sulphate, 10 Mgm.; distilled water, 10 Gm. In this pure strychnine will crystallize out on the sides of the container. Sodium cacodylate is often alkaline in reaction; sodium glycerophosphate is always more or less so. Strychnine cacodylate is also dissociated in water into its two constituents. If it be desired to administer strychnine sulphate with glycerophosphates or cacodylates, it should be given in a separate solution.

Spray Atomizer for Nebulae and Inhalations. (*Apoth. Zeit.*, 1913, **28,** 365.) The figure indicates the nature of the new spraying apparatus. It enables the medicated spray to be directed over a relatively small area. Since it is wholly of glass there are no metal parts to rust, clog or tarnish. The apparatus is easily sterilized. Besides being handy for clinical use, it serves for



the disinfecting or spraying of small apartments with such substances as formaldehyde solution.

Suppositories of Asafetida. (*Amer. Drugg.*, 1913, **61,** 87.) Asafetida is being frequently prescribed in suppositories in the U.S.A. in doses up to 10 grains. They are given in various rectal disorders, and especially for painful spasmodic contraction of the sphincter ani, for which they are very effective. The preparation of these suppositories has given trouble. It may best be effected as follows : Weigh out an amount of cacao butter equal to the weight of asafetida in the suppositories, that is 10 grains of cacao butter for each 10 grains of asafetida in each suppository, melt at gentle heat and triturate with the asafetida in a warmed mortar until this is uniformly distributed and then pour quickly into chilled moulds when just pourable. Another method is to make a mass of the powdered gum with an equal weight of cacao butter, finely grated, in a slightly warmed mortar, roll out the mass on a pill tile (warmed slightly) and divide into the required number of suppositories and shape into a pointed cone.

Suppositories, Theobroma Oil, Use of Beeswax in. J. van Riel and P. van Wielen. (*Pharm. Weekbl.*, 1912 [25] : *Schweiz. Woch. Chem. Pharm.*, 1913, **51,** 95.) The addition of a very small amount of beeswax, even 2·5 per cent., greatly increases the amount of liquid, such as aqueous solutions, glycerin, or ichthyol, which can be incorporated with the cacao butter

basis. For suppositories, pessaries, bougies or crayons as much as 1 part of fluid may be used with 2 parts of basis. In the case of iodoform, also, the use of 2·5 of wax with the oil of theobroma prevents the formation of large crystals separating as the mass cools. It is claimed that the use of this quantity of wax, or even of 4 per cent., does not raise the melting-point above body temperature.

Zinc Cream. (*Chem. and Drugg.*, 1913, **81,** 386.) The following prescription has given trouble from clotting, instead of producing a smooth cream, as desired: Pulv. zinci oxidi, ʒss; pulv. tragacanth, ʒss; S.V.R., ʒij; glycerin, ℥j; liq. plumbi subacet. fort, ʒss; aq. rosae ad, ℥vj. M. A satisfactory smooth suspension may be obtained by rubbing down the ZnO in a mortar with the basic lead acetate solution; adding the powdered tragacanth and triturating until it is well dispersed through the mixture; then pouring on the rectified spirit and triturating until the mixture is evenly damped, incorporating gradually first the glycerin, then the rose-water, stirring steadily until the last of the rose-water has been added. This method produces a white lotion free from visible clotting. On standing a deposit settles, but this readily diffuses when the lotion is shaken. The difficulty is due to the incompatibility of the tragacanth with the basic lead acetate.

Zinc Sulphide Lotion. J. F. McAnulty, Junr. (*Merck's Report; Canad. P.J.*, 1913, **46,** 353.) The following prescription sometimes gives trouble through improper dispensing. Sulphurated potash, 30 grs.; zinc sulphate, 30 grs.; rose-water to make 3 fl. oz. Dissolve the sulphurated potash in half the rose-water, and filter. Dissolve the $ZnSO_4$ in the other half and filter this into the sulphurated potash filtrate. Send out in a wide-mouth bottle.

GALENICAL PHARMACY

Bismuth Subgallate Gauze. E. A. R. Newman. (*Lancet*, 1913, **184,** 1794.) Bismuth subgallate gauze is recommended as a substitute for iodoform gauze. It has the following advantages: It can be sterilized, retains its bright yellow colour unimpaired, and is less costly than iodoform gauze. It is prepared by means of a suspension of bismuth subgallate in a mixture of glycerin 1 and alcohol 90 per cent. 2. After the evaporation of the spirit

the residual glycerin gives it a slightly damp feeling, which, however, disappears after sterilization and drying in a high-pressure steam sterilizer. Further, when thus dried, there is no tendency for the salt to "dust" out.

Preparation.—The practical details of preparation are as follows: 1. Wash the gauze thoroughly in soap and hot water and rinse in several changes of clean water; dry. 2. Cut up the dry gauze into convenient lengths for preparation (pieces of 1 yard or 4 yards in length are convenient in practice), and ascertain the weight of one such length. The quantity of the salt is then calculated. 3. To get the exact quantity of fluid required, saturate one such length in water, pressing it lightly to get rid of any great excess. Then squeeze out the fluid as completely as possible, collect and measure. If too little fluid is used it is difficult to get the salt evenly diffused; if too much, the cloth drips, and some salt is lost, with an unnecessary waste of rather expensive materials. 4. Make a suspension from the above data, mixing the salt with the glycerin first and then adding the spirit, stirring it briskly the while with a glass rod. 5. While still stirring, immerse the gauze, just moistened, as quickly as possible, and thoroughly knead it to get a uniform diffusion. To ensure this it is important that the gauze be previously just moistened with water. 6. Hang up or lay out to dry. When dry fold longitudinally three times—this gives an eight-fold gauze—and roll up. 7. Sterilize and store in a dust-proof receptacle. All antiseptic gauzes may be prepared in this way, varying the ingredients and proportions at will. Plain water is only necessary for cyanide gauze or for soluble salts.

Bismuth subgallate gauze prepared in this way has been tested for eight months in a hospital containing 50 surgical beds, and found to serve all the purposes for which iodoform gauze used to be advocated.

Bismuth Suspension for Skiagram Shadows. G. Rechou. (*L'Union Pharm.*, 1913, **54,** 266.) Most of the bismuth carbonate preparations used for obtaining a radioscopic shadow of the stomach lack homogeneity and stability. The following suspension answers well and gives a well defined shadow. Bismuth carbonate, 120 Gm.; powdered gum acacia, 20 Gm.; powdered tragacanth, 5 Gm.; simple syrup, 150 c.c.; water, 350 c.c.; orange flower water sufficient to flavour.

Bismuth Tartrate Scales and its Preparations. T. D. Mor-

son and J. Harpham. (*Chem. and Drugg.*, 1912, **81,** 947.) Bismuth tartrate in scales offers many advantages over the official Liquor Bismuthi and similar preparations, for it is readily soluble in water, and the solution is neutral or faintly acid. It is therefore compatible with pepsin, with certain alkaloidal salts used in medicine, and gives generally more stable mixtures. On incineration it gives about 50 per cent. of Bi_2O_3 and 13 per cent. of Na_2CO_3. A solution of 100 parts of the sealed tartrate requires from 2 to 3 parts of $NaHCO_3$ to give a neutral solution. The following formulae are suggested: *Liquor Bismuthi Tartratis.*—Bismuth tartrate scales, 1,040 grains; chloroform, 20 minims; alcohol, 40 minims; distilled water to 20 fl. oz. Dissolve the scales in 10 oz. of distilled water, mix the chloroform and alcohol, add to the solution, and make up to 20 fl. oz. with distilled water. Shake. (Similar procedure is to be followed with the other formulae.) *Elixir Bismuthi Tartratis.*—Bismuth tartrate scales, 300 grains; distilled water, 4 fl. oz.; aromatic elixir to 20 fl. oz. *Elixir Pepsini et Bismuthi Tartratis.*—Bismuth tartrate scales, 300 grains; stronger glycerin of pepsin, 2½ fl. oz.; alcohol (60 per cent.), 1 fl. oz.; simple elixir to 20 fl. oz. *Elixir Pepsini et Bismuthi Tartratis cum Strychnina.*—As above, with the addition of solution of strychnine hydrochloride, ½ fl. oz., before making up to volume. *Elixir Pepsini et Bismuthi Tartratis cum Ferro.*—Bismuth tartrate scales, 300 grains; pepsin, 160 grains; glycerin, 1¼ fl. oz.; distilled water, 2 fl. oz.; iron and ammonium citrate, 300 grains; alcohol (60 per cent.), 1 fl. oz., ; simple elixir to 20 fl. oz. *Elixir Pepsini et Bismuthi Tartratis Compositum.*—Bismuth tartrate scales, 300 grains; stronger glycerin of pepsin, 2½ fl. oz.; morphine acetate, 9 grains; diluted acetic acid, 20 minims; solution of strychnine hydrochloride, 96 minims; diluted hydrocyanic acid, 192 minims; alcohol (60 per cent.), 1¼ fl. oz.; tincture of cudbear, ½ fl. oz.; simple elixir to 20 fl. oz. *Mistura Bismuthi Tartratis Composita.*—Bismuth tartrate scales, 800 grains; chloroform, 80 minims; alcohol (60 per cent.), 2 fl. oz.; solution of strychnine hydrochloride, 300 minims; diluted hydrocyanic acid, 320 minims; tincture of cudbear, ½ fl. oz.; distilled water to, 20 fl. oz. *Mistura Bismuthi Tartratis Composita cum Pepsino.*—As above, but omitting the HCN, and adding stronger glycerin of pepsin, 2½ fl. oz., before making up to volume.

Blaud's Pill Mass, Modified Form for. (*Apoth. Zeit.*, 1913,

28, 43.) The following method is stated to give a Blaud's mass of good consistence, of negligible alkalinity and of greater facility of preparation than many published formulae: Glycerin, 90 by weight, and water 200, are heated together on the water-bath in a tared evaporating dish. Exsiccated $FeSO_4$, 700; powdered K_2CO_3, 400; $NaHCO_3$, 220; powdered sugar, 340; are mixed and added in small portions with stirring, to the warm liquid. Should the mixture become too dry, or evolution of CO_2 slacken, a little more water should be added. When all the CO_2 has been driven off, the mass is evaporated to a weight of 1,770. Powdered marshmallow root, 240, and powdered acacia, 20, are then incorporated. Of this mass 26 parts contains the equivalent 9 parts of anhydrous $FeSO_4$ or of 14 parts of $FeSO_4 7H_2O$.

Bromotannin Syrup. G. de Ridder. (*J. Pharm. d'Anvers. Répertoire*, 1912, **24,** 500.) Tannin, 2; bromine, 2; distilled water, 125; simple syrup to 1,000, by weight. Dissolve the tannin in water, 25. Mix this with a solution of the bromine in water, 100. To this add the syrup to make the prescribed weight.

Camphor Liniment, Red. J. C. Dills. (*Drugg. Circ.*, 1913; **57,** 323.) A 20 per cent. solution of camphor in white mineral oil, coloured red with alkanet, forms a popular substitute for camphor liniment. A convenient means of colouring oils with alkanet is to exhaust the root with petroleum benzin, distil or evaporate off the solvent, and dissolve the extract in Et_2O. This solution is perfectly miscible with oils, vegetable fats and hydrocarbon oils.

Camphorated Spirit, Simple Test for Camphor in. H. Bataille. (*Bull. Sci. Pharm.*, 1913, **19,** 409.) Exactly 10 c.c. of the sample is measured into a flask. Then distilled water is slowly run in, until a permanent precipitate is just visible. For a spirit of camphor, containing 1 of camphor in 9 by weight of alcohol 90 per cent. (as official in the French Codex), exactly 9 c.c. of water will be required. This simple test will detect both the fraudulent diminution of alcoholic strength and of camphor, which cannot be detected in some instances by merely recording the sp. gr., since the lower alcoholic degree accompanies a higher sp. gr. and less camphor gives a lower one. This camphorated spirit containing only 9 per cent. of camphor may be

made with alcohol 88 per cent. This will have the sp. gr. 0·845.

Cantharides Cerate, Proposed Formula for. G. C. Diekman. (*Drugg. Circ.*, 1912, **56,** 660.) Cantharides in No. 60 powder, 320 Gm.; acetic acid, 20 Gm.; liquid petrolatum, 130 Gm.; yellow wax, 180 Gm.; rosin, 180 Gm.; lard, 170 Gm.

Mix the cantharides with the acetic acid, and set the mixture aside, well covered, for 24 hours. Then add it to the liquid petrolatum, rosin, yellow wax and lard, previously melted, and strain through muslin; keep the mixture in a liquid condition by means of a water-bath, stirring occasionally, for 1 hour. Finally remove it from the bath and stir the mixture until it begins to congeal.

Cantharides Tincture and its Assay. N. L. Scoville. (*J. Amer. Pharm. Assoc.*, 1913, **2,** 18.) After a long series of experiments, which are recorded, the author has not yet succeeded in making a tincture which fully represents the drug, by any method or menstruum tried. Ordinarily, the drug is from one-quarter to one-third exhausted by percolation. By digestion, from half to three-quarters exhaustion is obtained.

The use of 10 per cent. glacial acetic acid and 90 per cent. of official alcohol (both by volume) has thus far proved the most efficient menstruum—tinctures made with this representing 80 to 90 per cent. of the drug used. Such a menstruum is, however, very strongly acid.

The following is the method employed for determining the amount of cantharidin in the tincture: 100 c.c. of 1 : 10 tincture is distilled rapidly to near dryness under reduced pressure, and the residue is rinsed into a 250 c.c. Erlenmeyer flask with small portions of distilled water, aided by a few drops of ammonia, using 40 c.c. of water in all. Ten c.c. of strong HCl is then added, a couple of capillary tubes dropped into the flask to prevent excessive bumping, and the mixture is boiled under a reflux condenser for about 15 minutes. The flask is then removed from the heat, and the hot aqueous liquid is sucked out from under its layer of fat with a pipette, taking care to remove as little of the fat as possible; 25 c.c. of distilled water and a few drops of HCl are added to the residue, boiled under the reflux condenser about 10 minutes and the aqueous liquid removed as before and added to the first. This process is repeated twice more, using 25 c.c. of water each time, and obtaining about

125 c.c. of combined liquid. This is cooled and shaken out with 30, 30, 20, 20 and 20 c.c. portions of $CHCl_3$, and the $CHCl_3$ filtered. The combined $CHCl_3$ washings are evaporated rapidly to about 10 c.c., then set aside in a moderately warm place for the remainder to evaporate spontaneously and the crystals of cantharidin to form. When the $CHCl_3$ has entirely disappeared (usually on standing over night), add a little Et_2O and evaporate off quickly. To the residue add 5 c.c. of a mixture of equal volume of absolute EtOH and petroleum ether, which has been saturated with cantharidin, and rotate the container occasionally until the crystals are loosened and the fatty matters are dissolved. Pour the liquid through a small pledget of cotton, retaining the crystals in the beaker, add 2–3 c.c. more of EtOH petroleum-ether solution and repeat until the crystals are free from fat. Then dissolve the crystals in 5 c.c. of warm $CHCl_3$ and filter through the pledget of cotton, receiving the filtrate in a clean tared beaker or flask. Wash the first flask and cotton with successive small portions of $CHCl_3$, then evaporate the combined washings rapidly, removing the last traces of $CHCl_3$ with a little Et_2O, dry the crystals at 40°C. for 30 minutes and weigh.

Carlsbad Pills. (*Pharm. Zeit.*, 1913, **58,** 200.) Extract of Cape aloes, 10 Gm.; extract of cascara, dry, 5 Gm.; Carlsbad salts, 2 Gm.; powdered licorice root, 1 Gm.; oil of fennel, 5 drops. Mass, divide into 100 pills and sugar-coat.

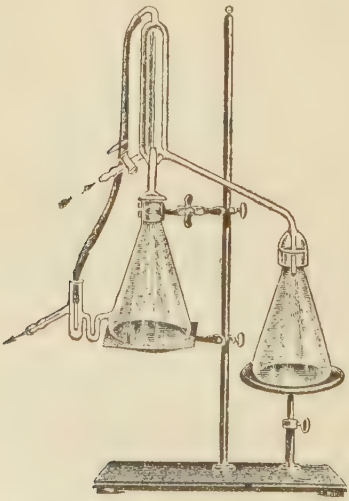
Cheron's Phosphatic Serum, Avoidance of Precipitation of, on Sterilizing. R. Guyot. (*L'Union Pharm.*, 1913, **54,** 86.) Cheron's serum is usually compounded with: NaCl, 2 Gm.; $Na_2SO_4 \cdot 10H_2O$, 8 Gm.; $Na_2HPO_4 \cdot 12H_2O$, 5 Gm.; crystalline phenol, 0·5 Gm.; distilled water to make 1,000 Gm. This is faintly alkaline in reaction, and when sterilized by heat it deposits. If 8 drops of H_3PO_4, sp. gr. 1·349, be added to each 100 c.c. of the serum before sterilization it will remain perfectly clear and will not cause any irritation or inflammatory action when injected.

Collodium Cantharidatum. (*Schweiz. Wochschr.*, 1912, **50,** 673.) In the formula of Pharm. Helv. IV, cantharidin partly remains undissolved. The following is an improved formula: Cantharidin, 0·2 Gm. is dissolved in warm castor oil, 5 Gm., and acetone, 7 Gm., and added to a mixture of Venice turpentine, 8 Gm. and collodium, 80 Gm. This amount of cantharidin is only half

that of Pharm. Helv., but the vesicating power is the same. Cantharidin is soluble in Et_2O 1 : 650 (not 1 : 950, Pharm. Helv.); soluble in a mixture of 1 part Et_2O, 7 parts EtOH, 1 : 460.

Copper Phosphate Injection for Tuberculous Affections. Luton. (*Prov. Med. J.; B.M.J. Epit.*, 1913, **1,** 95.) (*a*) Sodium phosphate, 5 Gm.; glycerin, 27·5 Gm.; water, 27·5 Gm. Dissolve. (*b*) Copper acetate, 1 Gm.; glycerin, 19·5 Gm.; water, 19·5 Gm. Dissolve. Mix (*a*) and (*b*). Do not filter. One Gm. = 0·01 Gm. Cu $2C_2H_3O_2$. Injection deeply into the buttock is the best method of administering.

Cremor Camphorae. (*Amer. Drugg.*, 1912, **60,** 369.) Powdered camphor, castile soap, ammonium carbonate, of each ʒii; oil of thyme, ʒi; tincture of opium, ʒii; oil of turpentine, ℥ii; water, sufficient to make 16 fl. oz. Dissolve the soap and ammonium carbonate, which should be in hard, transparent pieces, in 10 fl. oz. of water. Dissolve the camphor in the mixed oils and add this to the soap solution, and shake vigorously until an emulsion is formed. Finally add the tincture of opium and sufficient water to make 16 fl. oz. This makes an elegant preparation for external use. It is dispensed extensively in and around Philadelphia.



Digitalis, Acetic Extracts of, Unsatisfactory. W. A. Pearson. (*Amer. J. Pharm.*, 1913, **85,** 245.) The physiological activity of acetic fluid extract of digitalis is undoubtedly markedly less than the fluid extract made by U.S.P. method. In all probability the glucosides are promptly broken down by the acetic acid present.

Distilled Water, Fresh, Compact Apparatus for the Preparation of. A. Stephan. (*Apoth. Zeit.*, 1912, **27,** 583.) The great importance of using recently distilled water for making injections of neosalvarsan (and for all hypodermic in-

jections) has been fully established. This renders a small portable apparatus for the extemporaneous distillation of water a necessity. The author has adopted the ingenious form of continuous distillation flask figured, which is self-explanatory.

With this, 500 c.c. of "aqua neo-distillata" can be obtained in 30 minutes.

Dressings, Medicated, Valuation of. H. Serger. (*Südd. Apoth. Zeit.*, 1912, 126; *Pharm. Zentralh.*, 1912, **53**, 986.) The amount of material is weighed off and introduced into a graduated stoppered cylinder, and then treated with the prescribed volume of solvent, allowed to macerate for 30 minutes, and made up to a definite volume. Then an aliquot part is measured off, and used for the analysis. The volume occupied by the material may be disregarded. *Sublimate Dressing.*—Twenty Gm. of material is thoroughly moistened with hot 1·5 : 100 NaCl solution. When cold, volume is made up to 500 c.c. Of this 250 c.c. is filtered and precipitated with H_2S. The mercuric HgG is collected, thoroughly washed, transferred to a stoppered flask, and treated with 5 c.c. of CS_2 and 10 c.c. of N/10 I solution. The excess of I is then titrated in the usual manner with N/10 thiosulphate. Each c.c. of N/10 I solution used up = 0·01355 Gm. of mercuric chloride. *Iodoform Dressing.*—Five Gm. of material is macerated with 50 c.c. of Et_2O, and then made up to 100 c.c. Ten c.c. of this solution is added to 30 c.c. of N/10 $AgNO_3$; the mixture is warmed, with frequent agitation, in a bath of warm water for half an hour. Fifteen c.c. of 1 : 4 HNO_3 is then added, also 1 c.c. of saturated iron alum solution. The excess of $AgNO_3$ is then titrated with N/10 AmCNS solution. Each c.c. of N/10 $AgNO_3$ used up = 0·01313 Gm. of CHI_3. *Salicylic Acid Dressing.*—Five Gm. is macerated with 100 c.c. of alcohol. Fifty c.c. of the liquid is titrated direct with N/10 NaOH with phenolphthalein indicator, each c.c. of N/10 NaOH used = 0·138 Gm. of salicylic acid. *Boric Dressing.*—Five Gm. is macerated with 500 c.c. of a warm mixture of glycerin, 1, in water, 20. To 100 c.c. of the solution 25 c.c. of glycerin is added, and the mixture is titrated direct with N/10 NaOH and phenolphthalein indicator. Each c.c. of N/10 NaOH = 0·0062 Gm. of H_3BO_3. *Carbolic Acid Dressing.*—Ten Gm. of material is treated with 500 c.c. of warm water; 25 c.c. of the solution is transferred to a stoppered flask and

treated with 50 c.c. of 0·594 : 100 solution of KBr and 50 c.c. of 0·1667 : 100 solution of $KBrO_3$. After mixing, 5 c.c. of strong H_2SO_4 is run in, and the mixture is allowed to stand for 15 minutes. Then 10 c.c. of 1 : 10 KI is added, and the amount of liberated I titrated with N/10 thiosulphate. When a = the number of c.c of this used, the amount of phenol present, x, is found by the formula : $x = 0{\cdot}047 - (0{\cdot}00156 \times a)$. Another method consists in adding 50 c.c. of N/10 Br solution to 25 c.c. of the original solution. After 15 minutes' contact in a stoppered flask, 20 c.c. of 1 : 10 KI solution is added, and the liberated I titrated with N/10 thiosulphate. Each c.c. of N/10 bromine found to be used up = 0·00313 Gm. of phenol. *Dermatol, Airol, and Xeroform Dressings.*—Ten Gm. of material is thoroughly moistened with 20 c.c. of 25 per cent. HCl, then treated with 20 c.c. of hot water. After cooling, the volume is made up to 500 c.c. After well shaking, 250 c.c. is filtered, and treated with H_2S. The precipitate is collected, washed and transferred to a 100 c.c. graduated cylinder. Therein it is treated with 10 c.c. of N/10 $AgNO_3$ solution and 10 c.c. of 1 : 3 HNO_3. After adjusting the total volume to 100 c.c., 50 c.c. is filtered and titrated with N/10 AmCNS with iron-alum indicator. Each c.c. of N/10 $AgNO_3$ found to be used up = 0·00409 Gm. of dermatol, 0·00423 Gm. of airol, and 0·00383 Gm. of xeroform.

Druew's Paste. (*Drugg. Circ.*, 1913, **57,** 275.) Salicylic acid, 2 Gm.; pyrogallol, 4 Gm.; purified wood-tar, 4 Gm.; zinc oxide, 4 Gm.; soft soap, 5 Gm.; anhydrous wool-fat, 5 Gm.

Elixir of Iron Quinine and Strychnine Phosphate, Improved Formula for. G. Bachman. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 848.) Soluble ferric phosphate, 17·50 Gm.; quinine (alkaloid), 8·75 Gm.; strychnine (alkaloid), 0·275 Gm.; phosphoric acid, 2·00 c.c.; sodium citrate, 8·00 Gm.; alcohol, 60·00 c.c.; distilled water, 50 c.c.; aromatic elixir, to make up to 1000·00 c.c. Dissolve the alkaloids in the alcohol with gentle heat; add the solution to the phosphoric acid, which has been previously diluted with 375 c.c. of aromatic elixir. Dissolve the iron salt in 50 c.c. of warm water and mix. Add this mixture to the alkaloidal solution gradually with stirring. A precipitate is formed at once, but this readily dissolves upon the further addition of the alkaloidal and iron solution. Finally, add enough aromatic elixir to make the product measure 1,000 c.c. and filter, if necessary.

Ergot Preparations, Preservation of. P. S. Pittenger and C. E. Vanderkleed. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 799.) It is found that by storing galenical preparations of ergot in specially constructed vacuum flasks, they will retain their physiological activity for a considerable length of time.

Extractum Hippocastani Mentholi Salicylatum. (*Pharm. Post*, 1913, 816.) Ammonium iodide, 0·5; menthol, 1; salicylic acid, 5; alcoholic extract of horse chestnut, 27; wool fat, 5·5; glycerin, 11. This is also known as *Fragner's contrarheuman.*

Ferrous Carbonate Mass, Vallet's Mass. L. Metz. (*Nat. Drugg.*, 1913, **43**, 185.) The following is put forward as an improved formula: Ferrous sulphate, 100 Gm.; monohydrated sodium carbonate, 46 Gm.; clarified honey, 38 Gm.; sugar of milk, 25 Gm.; syrup and distilled water, sufficient. Dissolve the $FeSO_4$ and $Na_2CO_3H_2O$ each separately in 200 c.c. of boiling distilled water, and having added 20 c.c. of syrup to the iron solution, filter both and allow them to become cold. Introduce the Na_2CO_3 solution into an Erlenmeyer flask having a capacity of about 1,000 c.c., and gradually add the $FeSO_4$ solution, rotating the flask frequently, until the carbonic acid gas no longer escapes. Add a sufficient quantity of distilled water to fill the flask, cork it and set it aside so the $FeCO_3$ may subside. Siphon off the supernatant liquid, and having mixed the syrup and distilled water in the proportion of one volume of syrup to nine volumes of distilled water, wash the precipitate with the mixture until the washings no longer have a saline taste, draining off the washings each time by siphoning. Drain the precipitate on a muslin strainer previously moistened with the syrup mixture, and express as much of the water as possible. Lastly, mix the precipitate at once with the honey and sugar of milk. Evaporate the mixture in a tared dish on the water-bath, with constant stirring, until it is reduced to 100 Gm. By substituting 19 Gm. of glycerin and 19 Gm. of honey for the above 38 Gm. of honey, a good mass is obtained that will take a pill form, which will retain its pillular consistence.

Formulae of the Copenhagen Pharmacists' Association. (*Archiv. for Pharm. og. Chem.*, 1912 [24] and 1913 [1]; *Apoth. Zeit.*, 1913, **28**, 64.) *Cough Lozenges.*—Menthol, 0·05 Gm.; aceto-salicylic acid, 10 Gm.; peppermint oil, 1 Gm.; powdered quillaia bark, 10 Gm.; powdered ginger, 10 Gm.; powdered

white sugar, 220 Gm.; solution of carmine, 5 Gm. Mass and divide into 500 lozenges.

Tablets for Seasickness.—Sodium bromide, 5 Gm.; heavy magnesia, 2 Gm.; validol, 2 Gm. To make 10 tablets.

Phenolphthalein Chocolate Lozenges.—Phenolphthalein, 1·25 Gm.; chocolate neatwork, 5 Gm.; powdered white sugar, 5 Gm.; cocoa butter, sufficient to mass. Divide into 10 lozenges.

Nervine Tonic Powder.—Sodium glycerophosphate, 100 per cent., 50 Gm.; sodium caseinate, 940 Gm.; sodium bicarbonate, 5 Gm.; sodium chloride, 5 Gm. The powdered glycerophosphate is quickly rubbed down, in a warm mortar, with some of the caseinate; then mixed with the other ingredients and quickly weighed off into the prescribed doses. On account of the deliquescent nature of the glycerophosphate, the powders must be protected with waxed or parchment paper and stored in a dry place. [The admixture of a little powdered anhydrous Na_2HPO_4 would render the powder more stable.—*Ed., Y.B.*]

Grey Oil, Extemporaneous Substitute for. B. Sauton. (*Bull. Sci. Pharm.*, 1913. **20,** 346.) When HgCl and NaCNS are mixed the following reaction occurs: $2HgCl + 2NaCNS = Hg + Hg(CNS)_2 + 2NaCl$. This reaction is stated t ooccur generally when HgCl is introduced into the organism, where sulphocyanic acid is widely distributed. It affords a ready means of quickly preparing a substitute for grey oil for use for mercurial treatment. Calomel, 23·55 Gm., is rubbed in a mortar with sodium sulphocyanide, 8·10 Gm., and sufficient oil and lanoline to obtain 100 c.c. The suspension thus prepared will contain 0·02 Gm. of Hg per c.c., of which 0·01 is in the free state and 0·01 as $Hg(CNS)_2$. The former is in a state of extreme division. It keeps as well in suspension as grey oil. After some weeks the preparation turns yellowish, but there is no formation of $HgCl_2$ by this decomposition. Therapeutically, this extemporaneous preparation has been shown to be equivalent to grey oil as usually employed.

Grey Oil in Ampoules. T. Bengelsdorff. (*Pharm. Zeit.*, 1913, **58,** 191.) The oil is prepared by Zieler's formula: Mercury, 40; sterilized wool fat, 15; sterilized castor oil, 45. The sterilized ampoules are partly filled with Et_2O and gently heated until nearly all the Et_2O is driven off. The warm point of the ampoule is immersed in the oil. This is drawn up into the chamber as the ether cools. The neck is then fused up.

Iodinized Oil. (*Amer. Drugg.*, 1913, **61,** 81.) Iodine, 1 oz.; ether, sufficient; lanoline, anhydrous, 8 oz.; cottonseed oil, 128 fl. oz. This preparation is used as a counter-irritant for the treatment of pulmonary tuberculosis chiefly, but is an excellent application generally instead of tincture of iodine. It is made as follows: Dissolve the iodine, triturated to fine powder, in as small a quantity of ether as possible (usually about 4 to 6 oz.), add this solution to the cottonseed oil, in which the lanoline has been dissolved by heat while this is still warm and continue the heat on a water-bath until most of the ether has been evaporated. Iodinized oil so made should be a clear, dark reddish brown fluid; it does not usually stain the skin as does tincture of iodine and can be applied as a liniment. It is an excellent application to the throat and chest in cases of stubborn cough or sore throat.

Inhalation, Antiseptic, for Pulmonary Phthisis. D. B. Lees. (*B.M.J.*, 1912, **2,** 1271.) Creosote, 2 drachms; carbolic acid, 2 drachms; tincture of iodine, 1 drachm; spirit of ether, 1 drachm; spirit of chloroform, 2 drachms. Mix. Six to 8 drops of this to be poured on to the felt of a Yeo's inhaler once every hour during the day, and as often as the patient wakes at night. The inhaler to be worn constantly, and only taken off during meals. After meals, the mouth to be washed with a mixture of equal parts of Sanitas and water, at least 4 times a day. Two Yeo's inhalers should be used, one on alternate days. The one not in use should then be scalded and dried.

Iodotannin Syrup, Concentrated. L. Boulard. (*J. Pharm. Chim.*, 1913, **7,** 540.) Mix intimately in a mortar, iodine, 20 Gm., and tannin, 10 Gm.; when mixed, add another 30 Gm. of tannin. Treat this powder with EtOH 95 per cent., 160 Gm., added in separate portions, so as to obtain a series of saturated solutions, each being in turn decanted into a litre flask. When solution is complete, the mortar is washed out with a little water, which is added to the EtOH solution. Finally, 250 Gm. of cold simple syrup is added; the mouth of the flask being plugged with wool, the mixture is allowed to stand, with occasional agitation, for 48 hours. The flask is then transferred to the water-bath and heated gently for 2 hours. After this, the heat is increased until the alcohol boils, or distils over, and the residual liquid becomes red and transparent. This will be in 3 to 5 hours. It is then tested for free iodine with starch

paper, and heating continued further, if necessary, until all the free I has been taken up. The last of the alcohol is then distilled or evaporated off in a porcelain dish until it has lost 130 Gm. in weight. The liquid is then cooled and made up to 1,000 Gm. with simple syrup. Finally, the concentrated syrup is filtered through paper and preserved in amber glass bottles. One part by weight of this is added to 9 parts by weight of simple syrup for the preparation of iodotannin syrup for use.

Iron Compounds, Alteration of, by Light. C. Neuberg and O. Schewket. (*Pharm. Zeit.*, 1912, **57,** 815.) Iron saccharate, saccharo-manganate, malate, glycerophosphate, and ammoniocitrate are all affected by light so that their therapeutic value is quite altered, and in some cases physiologically active decomposition products, such as aldehydes and ketones, are formed. These preparations, therefore, should be kept in non-actinic, well closed glass containers. Their solutions should be freshly prepared in small quantities and similarly stored.

Kieselguhr for Pharmaceutical Use. H. C. Blirr. (*Amer. J. Pharm.*, 1912, **84,** 300.) The official recognition of kieselguhr instead of purified talcum is urged, since the former is about 4 times as efficient as the latter as a filtering agent; and its purity and identity are readily established by simple micro-examination. Good kieselguhr should absorb 4 times its weight of water. It is also suitable for use as an excipient and as an absorptive diluent.

Lotions, Various Formulae for. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 761.) *Lotio alba.*—Zinc sulphate, 5; sulphurated potash, 5; water or rose-water to make 125. Dissolve separately and filter. Pour the sulphurated potash solution slowly into the zinc solution. *Lotio alba composita.*—Precipitated sulphur, 5; white lotion to make 125. Triturate. *Lotio rubra.*—Zinc sulphate, 5; compound tincture of lavender, 60; water to make 1,000. *Lotio calaminae* (American Form).—Calamine, 4 Gm.; zinc oxide, 8 Gm.; glycerin, 12 Gm.; lime water, 15 c.c. Water or rose-water, a sufficient quantity to make 125 c.c. *Lotio calaminae composita.*—Phenol, liquified, 1 to 2 c.c.; calamine lotion, 100 c.c. Mix. *Lotio zinci oxidi.*—Zinc oxide, 20 Gm.; glycerin, 10 Gm.; rose-water, 70 Gm. To make 100 Gm. By the addition of about 0·1 Gm. of brown iron oxide, the so-called iron subcarbonate, a flesh-tinted preparation will be obtained. *Lotio magnesiae et zinci.*—Magnesium carbonate, zinc oxide, of

each, 4 Gm.; water, or rose-water, a sufficient quantity to make 125 c.c. *Lotio resorcinoli* (American formula).—Resorcin, 5 Gm.; diluted alcohol, 100 c.c. *Lotio pro erysipelas.*—Chloral hydrate, 40 Gm.; spirit of camphor, a sufficient quantity to make 125 c.c. *Lotio opii alkalina* ("Fuller's Lotion").—Sodium carbonate, crystals, 24 Gm.; tincture of opium, 30 c.c.; glycerin, 60 c.c.; water, 270 c.c. *Lotio pro alopecia* (Dandruff lotion).—Mercury bichloride, 0·4 Gm.; resorcinol, boric acid, of each, 20 Gm.; glycerin, 15 c.c.; alcohol, 125 c.c.; water, a sufficient quantity to make 250 c.c. To be used as wash for the scalp. *Lotio pro manibus* (hand lotion).—Citric acid, 0·6 Gm.; comp. tincture of lavender, 12 c.c.; alcohol, water, of each, 30 c.c.; glycerin, a sufficient quantity to make 125 c.c. *Lotio irritans* (*Granville*) (Granville's counter-irritant; antidynous lotions. (A—Mild).—Stronger solution of ammonia, 30 c.c.; spirit of rosemary, 24 c.c.; spirit of camphor, 8 c.c. Mix. (B—Strong).—Stronger ammonia water, 40 c.c.; spirit of rosemary, 16 c.c.; spirit of camphor, 8 c.c. Mix. These preparations will blister in periods, varied from 2 to 10 minutes, by saturating a piece of linen folder 5 or 6 times over a coin, and pressing it upon the part. Over more extended surfaces, a similar method is adopted by protecting the solution from evaporation.

Magnesium Citrate Solution, Quick and Simple Method for Preparing. R. J. Fritzinger. (*Nat. Drugg.*, 1912, **42,** 421.) For a quantity enough to fill one dozen bottles, pour into a wide-mouthed bottle of the proper capacity, 3,000 c.c. of water. To this add 396 Gm. of citric acid, and follow with 180 Gm. of magnesium carbonate, upon which drop one c.c. of lemon oil. Rotate the bottle on its side until the magnesium carbonate is thoroughly diffused through the liquid, and let it remain at rest until the reaction is completed. Into each "patent-stopper" bottle put 60 c.c. of syrup, and fill it with the filtered solution. Finally, drop into it the 1·5 Gm. tablet of potassium carbonate, and close.

The best results will be obtained if this solution is not filtered and bottled before the lapse of 12 to 24 hours; it may be used, if requisite, in 30 minutes.

Male Fern Extract, Valuation of. A. Goris and M. Voisin. (*Bull. Sci. Pharm.*, 1913, **19,** 705.) The authors find that the official process of the Swiss Pharmacopœia, a modification of Fromme's method of extracting the filicin by

means of $Ba(OH)_2$ and shaking out with Et_2O after acidifying, gives too high results. This is due to the Et_2O saturated aqueous extract when made acid, dissolving other substances than filicin. This error may be avoided by evaporating off all the dissolved Et_2O filtering, then acidifying and shaking out with Et_2O. The method of Schmidt, triturating with MgO, extracting the mixture with water, liberating the filicin from the MgO compound with HCl, and shaking out with Et_2O, distilling off the solvent, then drying over H_2SO_4, gives results comparable with the above. This, however, is not the case if the drying is performed at 100°C. as Schmidt directs. It is found that the requirement of 26 to 28 per cent. of filicin by the Swiss pharmacopœia is too high. A sample assaying 26 per cent. by the unmodified Swiss method will give only 20 per cent. by the MgO method. Commercial extracts of male fern lose about 2 per cent., *in vacuo*, over H_2SO_4. It is desirable that an international process should be adopted in the various pharmacopœias for the standardization of the preparation. (See also *Y.B.*, **1904,** 228; **1906,** 48, 215; **1912,** 325, and *Gen. Index.*)

Malt Extract with Cod-Liver Oil, Determination of Oil in. (*Evans' Analyt. Notes,* 1912, **7,** 52.) As instancing how the method of treatment may influence the result in the determination of oil, malt and cod-liver oil, the following results, obtained with an extract containing a 7·5 per cent. of cod-liver oil, are suggestive:

	Method of Extraction.	Solvent.	Indicated Oil per cent.
(1)	Extract mixed with sand and mass partially dried.	Petroleum ether, in Soxhlet.	7·7
(2)	Extract mixed with kieselguhr, mass well dried.	Petroleum ether, in Soxhlet.	10·8
(3)	Extract mixed with kieselguhr, mass undried.	Petroleum ether, in Soxhlet.	4·4
(4)	Simple maceration and stirring.	Petroleum ether.	0·7

Method (2) evidently facilitates the solution of a considerable amount of undesirable dark-coloured products.

Mercury Benzoate, Pure, for Injection, Preparation of. A. Desmoulière. (*L'Union Pharm.*, 1913, **54,** 206.) In preparing the solution of mercuric benzoate for injection, NaCl

or $NaC_7H_5O_2$ are employed. Much of the commercial benzoate fails to be soluble, or gives an acid solution. Pure mercury benzoate may be prepared as follows: HgO is obtained by pouring solution of $HgCl_2$ into a solution of pure KOH, and washing until free from KCl. The moist HgO is then dissolved in just sufficient $HC_2H_3O_2$ to give a neutral solution, leaving a trace of HgO undissolved. After filtration this is added gradually to excess of 1 : 20 solution of $NaC_7H_5O_2$. The precipitate is collected on a filter pump, drained, suspended in water and again collected and drained until the washings are neutral to litmus. The $Hg2C_7H_5O_2$ is then dried *in vacuo* over H_2SO_4. It is instantly soluble in NaCl or in $NaC_7H_5O_2$ solution and the solutions are neutral. About 0·3 Gm. of NaCl is sufficient to dissolve 1 Gm. of the benzoate. With this pure salt Gaucher's injection is prepared as follows. Pure mercuric benzoate, 1 Gm.; pure NaCl, 2·5 Gm.; sterilized distilled water, to make 100 c.c. This affords an injection which occasions only slight pain, and in which the Hg is accurately dosed, so that any desired quantity of mercury can be administered. If much pain is complained of, 1 or 2 Mgm. of cocaine hydrochloride may be added to each c.c.

Morphine and Narcotine, Solubilities of, in Acetone and in Water. G. Guerin. (*J. Pharm. Chim.*, 1913, **7,** 438.) At 15°C. crystalline morphine $C_{17}H_{19}NO_3H_2O$ dissolves in pure anhydrous acetone to the extent of 1·28 Gm. in 1,000 c.c. Narcotine, at the same temperature, dissolves to the extent of 41·96 Gm. in the same volume. At 15°C. mixtures of equal volumes of pure acetone and water, dissolve 0·70 Gm. of narcotine and 1·32 Gm. of morphine in 1,000 c.c. Narcotine is almost insoluble in distilled water, only to the extent of 0·10 Gm. in 1,000 c.c. at 15°C. Morphine is much more soluble, 0·288 Gm. dissolving in 1 litre of water at 15°C.

Mutton Tallow as Excipient for Pills.—Iavorschi. (*Boll. Chim. Farm.*, **51,** 372; *Abstr. Amer. Chem. Soc.*, 1913, **7,** 207.) The use of mutton tallow instead of keratin-coated pills is suggested. Experiments show that pills containing tallow mass will remain for about 1 hour in the stomach without change, but dissolve entirely in the intestines. The tallow should melt at 45–50°C, possess little odour, and have no rancidity. All substances irritating to the stomach, such as As, Hg, I, etc., as well as substances designed to act solely on intestines as pan-

creatin, antiseptics, and intestinal astringents, may be mixed with this mass. The quantity in each pill should not exceed 0·1 Gm. Pills should be kept in bottles containing lycopodium powder.

Nitroglycerin Tablets, Assay of. A. G. Murray. (*U.S. Dept. Agr., Bur. Chem., Bull.*, **152,** 248; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 397.) Crush 25 tablets under 10 c.c. Et_2O. Decant into a 50 c.c. flask, wash residue repeatedly with 5 c.c. Et_2O and make up to the mark. Transfer 20 c.c. to a tared dish, evaporate *in vacuo* and weigh the residue. Treat it with 2 c.c. of phenoldisulphonic acid reagent and after 5–10 minutes wash into a 100 c.c. flask and dilute to the mark. Transfer 10 c.c. to a beaker, dilute, neutralize with KOH and dilute to 100 c.c. Compare the colour with that of a standard nitrate solution similarly treated. $N \times 5{\cdot}4$ = nitroglycerin. To 5 c.c. of the Et_2O solution add 5 c.c. of 0·5 per cent. alcoholic KOH, place on a steam-bath and boil off the EtOH; add H_2O, expel EtOH, dilute to 250 c.c. and take an aliquot representing 0·02–0·04 Mgm. of nitroglycerin in a 100 c.c. flask, add about 50 c.c. H_2O, 1 drop of strong HCl, 2 c.c. of 1 per cent. sulphanilic acid solution and 2 c.c. of 0·5 per cent. naphthylamine-HCl solution. Dilute to 100 c.c. and after 30 minutes compare the colour with standard nitrite solutions similarly treated. Nitrite $N \times 8$ = nitroglycerin.

Novocaine Injection, Reclus's, for Local Anæsthesia.—Kendirdjy. (*J. Med. Chirg. Pract.: Répertoire*, 1912, **24,** 453.) Novocaine, 0·50 Gm.; adrenine solution (1 : 1,000), 25 drops; physiological solution to 100 c.c. To be freshly prepared as required, since it loses strength on keeping. The addition of the adrenine increases the analgesic power and prevents diffusion beyond the area of operation. It retards the development of anæsthesia, so operation should not be begun too soon. A 2 c.c. syringeful contains 1 centigramme of novocaine and half a drop of adrenine solution. As many as 25 such syringefuls may be used in such cases as radical reduction of hernia.

Oils, Various, Solubility of Salicylic Acid in. N. O. Engfeldt. (*Farm. Revy.*, 1913 [8]; *Apoth. Zeit.*, 1913, **28,** 182.) The following are the parts of salicylic acid dissolved by 100 parts of the oils indicated. Medicinal seal oil, 1·70; cod-liver oil, 1·86; arachis oil, 1·88; fixed oil of almonds, 2·08; olive oil,

2·14 ; rape oil, 2·17 ; poppy seed oil, 2·22 ; sesame oil, 2·61 ; hemp seed oil, 3 ; linseed oil, 3·04 ; walnut oil, 3·15 ; cottonseed oil, 3·23 ; castor oil, 12·98 ; liquid paraffin, 0. The solubility of salicylic acid in other oils may therefore be increased by the addition of castor oil.

"Ointment" Basis, non-Fatty, Anhydrous. — Stephani. (*Giorn. Farm. Chim.*, **61,** 451 ; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 533.) Powdered gum tragacanth, 3 Gm. ; alcohol, 94 per cent., 5 Gm. ; glycerin, 50 Gm., are mixed together. This forms a useful basis for incorporating aqueous solutions of drugs for application to the skin. By adding 42 Gm. of water to the above, a substitute for glycerol of starch is obtained.

Ointments, Pultiform, for Oculists' Use.—Ammon. (*Muench. Med. Woch. . Chem. and Drugg.*, 1912, **81,** 288.) *Mercurous iodide ointment*—Triturate mercurous nitrate with distilled water until 500 c.c. has been employed, being careful not to use great pressure, which might separate metallic mercury. The solution is filtered and added to a solution warmed to 50°C. of 1·32 Gm. of KI in 250 Gm. of distilled water, contained in a litre cylinder, in such a manner that mercury solution is distributed uniformly in the KI solution. The solution becomes cloudy and presently yellowish. The cylinder is stoppered and reversed several times until the HgI is completely precipitated in the form of a yellow coagulum. The excess of soluble mercury salt is eliminated by careful washing with water until the washings cease to give a blue colour with diphenylamine, or black with NaOH. This coagulum is then incorporated with lanolin to make a 1 per cent. ointment, and in the absence of light will keep for a year without alteration. *Mercuric iodide ointment.*—A solution of 1·5 Gm. of KI in 400 c.c. of water is poured into a solution of 1·2 Gm. of $HgCl_2$ in 300 c.c. of distilled water and treated as above. The precipitate is washed free from Cl and incorporated with lanolin, the finished product being kept from light.

Peruvian Balsam, Pharmacy of. P. E Hommell. (*Merck's Report,* **1912** ; *Lancet,* 1913, **184,** 335.) *Antiseptic dressing.*—Peruvian balsam, 1 ; castor oil, 10. *Ointment.*—Peruvian balsam, 1 ; anhydrous wool fat, 2 ; soft paraffin, 2. *Cerate.*—Peruvian balsam, 1 ; simple cerate, 4. *Syrup.*—Peruvian balsam, 100 ; alcohol, 90 per cent., 100 ; glycerin, 150 ; magnesium carbonate, 10 ; sugar, 700 ; water to make 1 litre.

Emulsion.—Peruvian balsam, 100 ; olive oil, 250 ; solution of saccharin N.F., 15 ; glycerin, 350 ; powdered gum acacia, 150 ; cinnamon water to make 1 litre. *Collodion.*—Peruvian balsam, 1 ; collodion, 9. (See also *Y.B.*, **1907,** 207 ; **1908,** 248 ; **1911,** 249, 271.)

Pessaries and Suppositories. B. Salomon. (*Pharm. Zeit.*, 1913, **58,** 502.) For general use a gelatin-glycerin basis is preferred, except for those drugs which are incompatible with gelatin. In the preparation of this care should be taken that air bubbles are not introduced by excessive stirring. Coignet's "Gold Medal" sheet gelatin is found to be the most satisfactory kind for use. A strong stock gelatin base is prepared from : Gelatin, 1 ; water, 2 ; glycerin, 2 parts by weight. This is heated in the steam-bath for 4 hours, with only cautious stirring. The pellicle which will have formed is removed, the hot liquid is poured into a square on a slab, and when set, cut into pieces. To make pessaries, 2 parts of this stock mass is melted, and 3 parts by weight glycerin added. Any medication should be previously dissolved in the glycerin ; or in a little water and mixed with a corresponding weight of glycerin. For tannin preparations, excessive heating must be avoided. The tannin should be dissolved in the glycerin, and the solution added to the melted stock mass. The mixture should be only just pourable and run quickly into the moulds. With extract of hamamelis and hydrastis, the addition of a little citric acid improves the appearance of pessary, thus : Extract of hamamelis, extract of hydrastis, of each, 0·05 ; citric acid, 0·10 ; gelatin mass to make 1 pessary. The soap glycerin basis is not to be recommended, since it does not keep well. For pessaries that are required to melt very slowly, agar-agar is the best basis. This is thus prepared : Agar-agar, 3, is tied into a bundle with muslin softened in water, 100 ; then boiled down to 60. To the strong, hot decoction, glycerin to make the weight 200 is added. The formula for glycerin suppositories in the French Codex contains too much glycerin ; it may be improved as follows : Glycerin by weight, 10 ; cacao butter, 30. The rasped cacao butter is melted at a gentle heat, the glycerin mixed in by stirring, and the mass poured as it begins to set.

Phenolphthalein Pastilles. (*Drugg. Circ.*, 1913, **57,** 14.) Phenolphthalein, 10 Gm. ; powdered cocoa, 10 Gm. ; sugar, 8 Gm. ;

milk sugar, 8 Gm.; talc, 4 Gm.; solution of vanillin (3 per cent.), 1 c.c. Make 100 pastilles.

Pepsin Essence. J. E. Justice. (*Nat. Drugg.*, 1912, **42,** 525.) Pepsin scale, 8·3 Gm.; hydrochloric acid, 2 c.c.; aromatic elixir, 120 c.c.; glycerin, 30 c.c.; water, 180 c.c.; alcohol, 100 c.c.; sweet wine, to make 500 c.c. Dissolve pepsin in 120 c.c. of water and add the HCl, set aside for 12 hours with occasional agitation; then add alcohol, glycerin, aromatic elixir, remainder of water and enough sweet wine to make 500 c.c.; to this add about 30 Gm. of purified talcum, agitate occasionally for about 6 hours and filter.

Phosphatic Emulsion of Cod-Liver Oil. Phosphoric acid, dilute, 3 fl. oz.; cod-liver oil, 8 fl. oz.; glycerin, 3 fl. oz.; West Indian rum, 8 fl. oz.; oil of bitter almonds, 20 minims; orange flower water, 8 fl. oz.; yolks of egg, 6; water, sufficient.

Emulsify the cod-liver oil with the egg yolks and orange flower water, add the oil of bitter almonds and glycerin with constant trituration and finally the rum, dilute phosphoric acid and sufficient water to make 32 fl.oz. of emulsion. This is the best and most palatable emulsion of cod-liver oil for consumptive patients. It is not troublesome to make, the main point is to have the oil thoroughly emulsified by the egg yolks before adding the other ingredients. The dose is a table-spoonful three or four times daily. (See also *Y.B.*, **1912,** 307.)

Pine Inhalation, Compound. (*Canad. P.J.*, 1912, **46,** 115.) Oil of pine, ʒij; terebene, ʒij; creosote, ʒss; menthol, ʒss; oil of cinnamon, ♏x; oil of eucalyptus to, ℥j. *Directions.*—Sprinkle a few drops on a handkerchief or cotton wool and inhale through each nostril separately; or put a teaspoonful into a pint of boiling water and inhale the vapours.

Prunus Mississipiensis Leaves for Pharmaceutical Use. L. Musso. (*J. Pharm. Chim.*, 1912, **6,** 301.) Since *Prunus mississipiensis* grows more freely in Algeria than *P. lauro-cerasus*, it has been suggested as a source for cherry laurel water. If so used, however, a smaller volume of distillate must be collected, since the leaves of the American plant grown in Algeria contain less HCN than those of the true cherry laurel. In both cases it is important that the material employed should be quite fresh and carefully crushed. A better water is obtained if the worm after leaving the still, is upright or vertically inclined, before it

descends into the cooling tank. (See also *Y.B.*, **1910,** 306; **1911,** 283, 284; **1912,** 306.)

Resorcinol Ointment, Preparation of. A. Raphaelson and — Breitfeld. (*Apoth. Zeit.*, 1912, **27,** 405, 430; *Pharm. Zeit.*, 1912, **57,** 554.) Raphaelson calls attention to the importance of using pure resorcinol in the form of the finest possible powder for the preparation of ointments. Breitfeld uses a saturated syrupy solution of resorcinol in Et_2O; this is incorporated with the fatty basis, and the solvent is dissipated by trituration. In this way the drug is obtained in the finest state of division.

Rhubarb and Soda Mixture, Improved Formula for. A. F. Marquier. (*Amer. Drugg.*, 1913, **61,** 83.) Sodium bicarbonate, 35 Gm.; potassium carbonate, 3 Gm.; fluid extract of rhubarb, 15 c.c.; fluid extract of ipecac., 3 c.c.; spirit of peppermint, 15 c.c.; alcohol, 90 per cent., 100 c.c.; glycerin, 250 c.c.; water to make, 1,000 c.c. Mix and filter.

Rhubarb as a Cheap Yellow Colouring Agent. J. K. Thum. (*Amer. J. Pharm.*, 1913, **85,** 19.) A 3 : 100 tincture of rhubarb prepared by percolation is recommended as a yellow colouring for mixtures, in place of the more costly golden seal preparations employed in the United States for their tinctorial property.

Salvarsan, Sterile Suspension of, for Intramuscular Injection. P. H. Marsden and B. Whatley. (*Pharm. J.*, 1913 [4], **36,** 586.) An excipient is prepared by heating equal weights of anhydrous lanolin and sesame oil in an air oven for 10 minutes at 110°C. The ampoules to contain the suspension, and an agate mortar and pestle required for the manipulation are heated to a temperature of 120°C. for half an hour. For filling the ampoules a record Ehrlich-Hata syringe of 10 c.c. capacity is used. The method of sterilizing this is by filling and emptying the syringe several times with liquid paraffin which had been previously heated to 110°C. If the syringe be placed into liquid paraffin and heat applied it will be found that much care is required to prevent the metal parts of the syringe separating from the glass barrel, due to their being attached by fusible metal, which melts at a temperature not much above 110°C. The syringe should not be sterilized by the ordinary method of boiling in water, as the least trace of water in the preparation is fatal

to the suspended salvarsan, causing it to clot and block up the needle.

The salvarsan is then rubbed down in an agate mortar to a fine powder, adding the melted excipient and filling into the ampoules with the sterile syringe. The filled ampoules are placed immediately upon ice to hasten the setting of the suspension and prevent the salvarsan from depositing, and are then sealed up in a Bunsen flame. When required for use the filled ampoule is immersed in warm water for a few minutes, dried, and opened at a file mark, then drawn into the syringe and injected into the deep muscles of the thigh. Three strengths are in use :—(1) Containing 0·1 Gm. Salvarsan in 1 c.c. (2) Containing 0·3 Gm. Salvarsan in 2 c.c. (3) Containing 0·6 Gm. Salvarsan in 2 c.c.

Saw Palmetto and Santal Elixir Compound. (*Amer. Drugg.*, 1913, **61,** 124.) Saw palmetto berries, 250 Gm. ; corn silk, dried, 250 Gm. ; sandalwood, ground, 50 Gm. ; sugar, 150 Gm. ; alcohol, 350 c.c. ; water, sufficient to make 1,000 c.c. Moisten the drugs, in moderately fine powder, with a menstruum of alcohol 350 c.c., water 750 c.c., pack in a percolator and macerate for 24 hours with added menstruum. Pour on the remainder of the menstruum and start percolation at a slow rate, adding enough water through the exhausted drugs to make the percolate measure about 750 c.c. Dissolve the sugar in this and complete the exhaustion of the drugs in the percolator with warm water until the final product measures 1,000 c.c.

One fluid ounce represents 120 grains each of raw palmetto berries and corn silk and 30 grains of sandalwood. This elixir may be coloured with caramel if desired, and can be flavoured with a mixture of essential oils to disguise the taste of the bitter drugs if preferred. The most suitable mixture of essential oils for flavouring would be 8 parts of oil of orange and 1 part each of oils of anise and cinnamon, 10 c.c. of this being dissolved in the alcohol used for percolation.

Sera, Preservation of, with Glycerin. Y. M. Kerener. (*Russki Vratch.*, **11,** 1174 ; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 1910.) Sera preserved in glycerol remain as active as the original. Agglutinative power on bacteria is more intense, and the specificity is greater with glycerin preserved sera.

Serum, Renzi's. (*L'Union Pharm.*, 1913, **54,** 160.) Iodine, 1 ; potassium iodide, 3 ; sodium chloride, 6 ; water, 1,000.

Serum, Sydmann's. (*L'Union Pharm.*, 1913, **54,** 160.) Sodium chloride, 6 ; sodium bicarbonate, 1 ; water, 1,000.

Sodium Oleate in Pills. (*Pharm. J.*, 1912 [4], **35,** 92.) Powdered sodium oleate is best for pills, massing with anhydrous wool fat ; stiffening with kaolin if other softer ingredients are prescribed.

Splints, Celluloid. J. W. Peck. (*Pharm. J.*, 1913 [4], **36,** 5.) An illustrated article, indicating the methods to be followed in taking plaster casts of limbs in orthopoedic cases, and the preparation of splints therefrom by means of repeated coats of celluloid solution 1 : 10 in acetone. The inflammable nature of the splints is noted, but the many advantages they possess over the ordinary kind is considered to more than counterbalance this disadvantage, which may be reduced to a minimum by the exercise of ordinary care.

Sterilization of Dressings. L. Grimbert. (*J. Pharm. Chim.*, 1912, **6,** 5.) Of all methods of sterilizing dressings, that of exposing them to steam under pressure is the most effective. When the object to be sterilized comes directly in contact with the steam under pressure, a temperature of 110°C. for 15 minutes' exposure is sufficient. But to ensure complete penetration of thick material such as cotton, a temperature of 120°C. for half an hour should be employed. Even if the material to be sterilized is enclosed in a sealed container, if the temperature fully reaches 120°C. and is maintained at that for 15 minutes sterilization will be complete, since all material contains sufficient vapour to generate the steam requisite to destroy all germs. In order to be positively certain that the temperature in the innermost portion of any bundles of dressing has attained, or exceeded this degree, the temperature may be allowed to rise to 130°C. for a shorter period. As indicators, sealed tubes of pure benzoic acid, m.p. 121·4°, may be packed in the centre of the material ; this should be melted when the operation is completed. If a higher temperature be desired, although this is not really necessary, phthalic anhydride, m.p. 129°C., may be employed in a similar manner.

Syrup, Compound, for Palatable Administration of Quinine. P. E. Hommell. (*Nat. Drugg.*, 1913, **43,** 96.) The following syrup is recommended as a palatable means of administering quinine in reasonable doses. **Quinine sulphate,** 1 drachm ;

dilute hydrobromic acid, q.s. to dissolve; compound tincture of cardamoms, 4 drachms; anise water, 4 drachms; simple syrup to make 4 fl. oz. Dose: one teaspoonful.

Syrup, Iodotannic, Simple Formula. H. Pecker. (*J. Pharm. Chim.*, 1913, **6,** 69.) Introduce into a strong, tared 1,000 c.c. flask, tincture of iodine (1 : 10), 20 Gm.; tannin, 4 Gm.; shake well and add simple syrup to make 1,000 Gm. Cork well and heat on the water-bath until in about 15 minutes the red colour changes to mahogany yellow. Test with starch to ensure the absence from free iodine. This gives a stable, pleasant-flavoured preparation containing at least three-fifths of its iodine in organic combination. The rest is present as HI.

Tincture of Iodine of American Pharmacy. L. F. Kebler. (*Amer. J. Pharm.*, 1913, **85,** 153.) Tincture of iodine U.S.P. contains about 6·86 Gm. of free I and 5 Gm. of KI in 100 c.c. In 50 commercial samples examined, the amount of iodine varied from 1·97 Gm. to 9·26 Gm. in 100 c.c., and the KI from none to 6·82 Gm. in 100 c.c.

PHARMACOPŒIA REVISION NOTES

Aconite Root, Standardized Powdered Alcoholic Extract of. E. H. Farr and R. Wright. (*Pharm. J.*, 1913 [4], **36,** 216.) After summarizing the published results of others on the alkaloid and extract values of aconite root and fresh herb, the authors detail their own experiments.

Extract.—In samples of solid extract prepared by the authors 2·44 per cent. total alkaloids were found equivalent to 3·08 in the dry extract, while in a number of dry extracts specially prepared from 1·2 to 6 per cent. total alkaloids was present. The last was from a sample of English root, which, apparently, as a rule contains much more alkaloid in proportion to extractive than foreign root.

Judging from the figures available, good samples of aconite root contain twice as much alkaloid as the leaf, and the extract from the root three or four times as much as the extract from the leaves.

In order to complete the series of extracts required as standards, a number of samples of aconite root were obtained in No.

40 powder and treated in the following manner: A convenient quantity of the drug was taken and moistened with one-fourth its bulk of 70 per cent. alcohol. The mixture was allowed to stand for 4 hours and was then packed in a percolator, more menstruum was added, and percolation allowed to proceed until a volume of percolate was obtained equal to four times the bulk of the drug employed.

The amount of dry extract was determined by exposing 5 c.c. of the sample in a flat-bottomed tared porcelain dish over a water-bath until the extract ceased to lose more than 1 Mgm. after 1 hour's exposure. The alkaloids were determined by the process of the U.S.P., slightly modified. Twenty c.c. of the percolate was placed in a porcelain dish, 20 drops of dilute H_2SO_4 and 25 c.c. of distilled water added, and the mixture evaporated until all the EtOH had been driven off. The residual liquid was allowed to cool and was then filtered through cotton wool into a separator, the dish and filter being washed with 10 c.c. distilled water. The liquid in the separator was shaken twice with 10 c.c. of $CHCl_3$, which was subsequently drawn off and rejected. AmOH was then added in distinct excess and the alkaloids shaken out with 15 + 10 + 10 c.c. of $CHCl_3$. The $CHCl_3$ solutions were drawn off in turn and bulked, and were then agitated with a mixture of 10 c.c. N/10 H_2SO_4 and 40 c.c. distilled water, used in three portions. The acid alkaloidal solutions were filtered through cotton wool into a second separator and shaken with a mixture of 4 c.c. of solution of AmOH and 25 c.c. of Et_2O. The Et_2O solution was drawn off into a beaker and the process repeated with 15 + 10 + 10 c.c. of Et_2O.

The mixed Et_2O solutions were evaporated to dryness, the residue dissolved in a mixture of 5 c.c. N/20 H_2SO_4 and 20 c.c. of water and the solution titrated with N/20 KOH, using tincture of cochineal as indicator. After the determination of the Et_2O soluble alkaloids the amorphous bases were removed from the solution left in the separator by shaking with 10 + 10 + 10 c.c. of $CHCl_3$, the latter being drawn off, bulked and evaporated to constant weight over a water-bath. The following results were obtained:—

TABLE SHOWING PERCENTAGE OF DRY EXTRACT, TOTAL ALKALOIDS, AND ETHER-SOLUBLE ALKALOIDS FROM ACONITE ROOT.

A.—FROM ENGLISH ROOT.

No.	Dry Extract.	Ether-soluble Alkaloids.	Total Alkaloids.	Ether-soluble Alkaloids in Dry Extract.
1	22·45	0·471	0·645	2·00
2	28·27	0·572	0·846	2·02
3	23·52	0·581	0·710	2·47
4	29.30	0·550	0·713	1·87
5	26·00	0·860	0·472	1·38
Average	25·91	0·506	0·677	1·95

B.—FROM FOREIGN ROOT.

1	38·32	0·371	0·484	0·97
2	28·00	0·080	0·272	0·28
3	26·25	0·160	0·250	0·61
4	28·50	0·235	0·345	0·85
Average	30·27	0·212	0·338	0·68

There is, therefore, great disparity between the relation of alkaloid to extractive in English and foreign aconite root, to the disadvantage of the latter. It is quite possible to obtain samples of foreign root of high alkaloidal value, but the bulk of the drug sent to this country is of inferior quality, being much mixed and containing a large proportion of old roots.

The results further indicate that no difficulty need be experienced in producing a powdered extract from English root containing 1 per cent. of ether-soluble alkaloids. The dose of aconitine is from 1/650 to 1/250 grain, and that of an extract such as we propose would be from $\frac{1}{8}$ to $\frac{1}{4}$ grain.

The process employed is as follows: Take any convenient quantity of the drug in No. 40 powder, moisten it with one-fourth its bulk of 70 per cent. alcohol, pack in a percolator, add more menstruum and allow percolation to proceed until a volume of percolate equal to four times the bulk of the drug w/v has been collected. Press the marc, mix the liquids, filter. Determine the amount of dry extract yielded by the percolate, and

the proportion of alkaloid contained therein. Take any convenient quantity of the percolate, mix with it an amount of the diluent somewhat less than calculation has shown will be necessary to bring down the dry extract to the required standard, recover the alcohol by distillation and dry the residue in a shallow, flat-tared dish, first over a water-bath and finally in a current of warm air at a temperature of from 60° to 80°C. until the weight is fairly constant. Take the weight of the dish with its contents, calculate the additional amount of the diluent which will be required, add this to the product of evaporation, transfer the whole to a dry, slightly warmed mortar and triturate carefully until thoroughly mixed. Finally, pass the powdered extract through a No. 20 sieve, transfer to a well corked or glass-stoppered bottle and preserve in a cool, dry place.

As a diluent a powdered root of high alkaloidal content is preferred, the value of which has been determined, or alternatively the exhausted marc may be employed.

The following process is recommended for the assay of the extract: 10 Gm. of the powder is slightly moistened with 70 per cent. alcohol, the mixture set aside for an hour, and then packed firmly in a small tube to which an air-pressure ball is attached and percolation carried on under pressure until 100 c.c. has been collected or the marc is exhausted. The ether-soluble alkaloid in the percolate is then determined by the above method. The result obtained, multiplied by ten, will give the required percentage.

Antipyrine, Improved Method for Determining, as Iodo-Antipyrine. C. Astre. (*J. Pharm. Chim.*, 1912, **5**, 211.) The following is a modification of the French Codex method for the determination of phenazone. 0·5 of Gm. the sample is dissolved in the boiling water-bath in 50 c.c. of water, and heated therein for 10 minutes. The flask being removed from the water-bath, 10 drops of AmOH, sp. gr. 0·924, are added and then, gradually, a reagent composed of KI, 80; I, 60; water, 300, until the yellow colour persists for some seconds. Crystals then form. More of the reagent is cautiously added until the yellow tint is just evident after heating for some minutes in the water-bath. The liquid is then completely cooled, the crystalline precipitate is collected, washed with 50 c.c. of distilled water in 3 portions; then drained, dried and weighed. One Gm. of the precipitate = 0·70 Gm. of antipyrine.

Bottles, Medicine, Alkalinity of the Glass of. E. Anneler. (*Pharm. Zeit.*, 1913, **58,** 309.) The author has found that 24 per cent. of the new medicine bottles examined have a sufficient alkalinity to affect the stability of many delicate pharmaceutical preparations. It is suggested in the next edition of the Ph. G. there should be an official test, with a limit, for the alkalinity of glass bottles. This is the more necessary, since price is absolutely no guide in the matter; cheaper bottles often contain less free alkali than dearer.

Cardamoms, Compound Tincture of, U.S.P. J. K. Thum. (*Amer. J. Pharm.*, 1912, **84,** 298.) The present U.S.P. process for the preparation of this tincture is one of simple maceration. It is stated that this is to obviate the difficulty of percolation in the case of cinnamon bark. This ingredient, even in the maceration tincture, causes trouble by depositing. It is suggested to replace this with spirit of cinnamon as in the following formula. Tinctura cardamomi composita: Cardamom, 25 Gm.; caraway, 12 Gm.; cochineal, 5 Gm.; spirit of cinnamon, 2·5 c.c.; glycerin, 50 c.c.; diluted alcohol (49 per cent.), a sufficient quantity to make 1,000 c.c.

Mix the cardamom, caraway and cochineal, and reduce them to No. 40 powder. Then moisten with 25 c.c. of diluted alcohol, pack firmly in a cylindrical percolator, and gradually pour diluted alcohol upon it until 940 c.c. is obtained; then add the spirit of cinnamon, glycerin and sufficient of the weak percolate to make up to the required volume, and mix. [British pharmacists will note that this and the U.S.P. preparation contain no raisins.]

Chemicals, Certain Pharmacopœial, Suggested Inclusion of Working Formulae for the Manufacture of. W. H. Glover. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 865.) It is suggested that working formulae for small quantities, say 100 Gm., for certain chemical compounds, such as ammonium iodide, strontium iodide, zinc iodide, calcium chloride, calcium bromide, and other chemicals which do not keep well, and are not frequently prescribed, should be officially given in the U.S.P.

Cinchona, Liquid Extract of. P. Carles. (*J. Pharm. Chim.*, 1913, **7,** 343.) The use of HCl is most strongly objected to as a solvent for the alkaloids, since it breaks up the natural combinations of the bases, and extracts a quantity of nauseous

matter. The only points to be urged in its favour are more thorough extraction and greater miscibility. The author does not consider that these two should be attained at the sacrifice of therapeutic activity. The method of percolation is also condemned, for the reason that the stronger percolates dissolve out more constituents than the original menstruum, so that the finished product tends to deposit. The method advocated is a process of successive maceration, in closed vessels in alcohol 18 to 20 per cent. Only wine alcohol should be used; and the bark should be carefully selected for its flavour. The finished fluid extract should be stored in full bottles, in the wine cellar, or even in the open air during winter, for one or two years. When thus matured and fined, it will develop an excellent flavour and will, moreover, have a marked therapeutic superiority to those preparations made by percolation with acid menstrua, or containing glycerin.

Cinchona, Liquid Extract of. K. Kollo. (*Pharm. Prax.*, 1913 [2]; *Pharm. Zeit.*, 1913, **58,** 289.) Two parts of marble lime is staked and enough water added to it to make a milky fluid. With this 100 parts of powdered cinchona bark is evenly moistened. The magma is heated on the steam-bath, and sufficient Am_2CO_3 added to convert the $Ca(OH)_2$ into $CaCO_3$. When dry, the powder is percolated with EtOH, 68–70 per cent., to obtain 100 parts of percolate. The EtOH is distilled off and the residue, about 25 to 30 parts of thick extract, is weighed, and the total alkaloids are determined in a small portion. Enough water and HCl is then added to produce a liquid containing 6 per cent. of total alkaloids and 10 per cent. of dilute HCl. The mixture is set aside, with occasional thorough stirring, for three or four days. It is then filtered; the alkaloidal content of the filtrate is again determined. A further dilution with water is made, and after standing several days another filtration is performed. Then enough glycerin and alcohol are added to give 10 per cent. of each in the finished product, and sufficient water to bring the alkaloidal value to not less than 4 per cent.

Cinchona, Liquid Extract of, Proposed Formula for, for French Codex. J. Warin. (*Pharm. Chim.*, 1913, **7.**) The following is claimed to be an improvement on the method at present official in the French Codex, and to give a product miscible, without turbidity, with water and with alcohol. Powdered

cinchona bark, in No. 60 powder, 500 Gm.; dilute hydrochloric acid, sp. gr. 1·049 = 10 per cent., 100 Gm.; alcohol, 95 per cent., 60 Gm.; water, q.s. To 1,000 Gm. of water add 65 Gm. of the dilute HCl. Moisten the powder with 300 Gm. of this, mix well, allow to stand for 2 hours, then pack in a non-metallic percolator. Percolate slowly with the rest of the acid menstruum, and as soon as percolation commences, close the lower orifice and macerate for 48 hours. Then allow percolation to proceed, continuing it by the addition of another 4,000 Gm. of water containing 10 Gm. of dilute HCl. Continue percolation, with water only, until the bark is exhausted, as shown by 2 drops of the percolate giving no precipitate with 4 drops of Na_2CO_3 solution. Concentrate the percolates to 400 Gm., add 25 Gm. of dilute HCl, mix well and set aside. Then add the alcohol, and sufficient water to make the final weight 500 Gm. Filter if necessary. It is suggested that the standard for total alkaloids should not exceed 3·5 per cent. It is found that a bark rich in total alkaloids does not necessarily give a correspondingly greater yield of fluid extract of 3·5 per cent. standard by this method. The best bark to use is one of medium richness in alkaloids.

Drugs, Standardization of. W. L. Scoville. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 1339.) The present plan adopted in the fixing of standards for drugs in the U.S.P., of taking a minimum yield of the drug as the standard is not satisfactory. Because in certain years it is impossible to get a drug which will assay at a certain figure, it is no reason why the official standard for preparations of the drug should not be based on a higher figure. The present plan makes commercial conditions the basis of scientific usage. The error lies in ignoring the fact that drugs are not in themselves medicaments, but are the source from which medicaments are made. A standard is a hypothetical drug. Nature barely produces it. If she ever does, it is by accident. It is suggested that a more satisfactory method would be to take the mean yield of the active principle serving as the basis of standardization, as observed by analysis extending over a period of years. As a tentative scheme, put forward for discussion, it is suggested on these lines that: *Aconite fluid extract* should contain 0·65 per cent. w/v and aconite tincture 0·065 per cent. w/v of alkaloids; *Belladonna leaf extract*, 1·6 per cent., and *tincture* 0·04 per cent. w/v of alkaloids; *Belladonna root fluid extract*, 0·50 per cent. w/v of alkaloids; *Col-*

chicum seed fluid extract, 0·60 per cent. w/v, *tincture*, 0·06 per cent. w/v of alkaloids; *Hydrastis fluid extract*, 3 per cent. w/v of alkaloids, *tincture*, 0·6 per cent. w/v; *Guarana fluid extract*, 4 per cent. w/v; *Hyoscyamus extract*, 0·3 per cent. of alkaloids; *fluid extract*, 0·75 per cent. w/v; *tincture*, 0·0075 per cent. w/v; *Ipecac. fluid extract*, 2·0 per cent. w/v; *Nux vomica fluid extract*, 2·0 per cent. of alkaloids; *Physostigma extract*, 2 per cent. of alkaloids, *tincture*, 0·02 per cent.; *Pilocarpus fluid extract*, 0·75 per cent. w/v; *Stramonium extract*, 1·5 per cent. of alkaloids; *tincture*, 0·835 per cent. w/v.

Eucalyptus Globulus Oil, Test for, of the French Codex, 1908. — Challet. (*Bull. Soc. Pharm. de Bordeaux; Répertoire*, 1912, **24**, 308.) The author shows by direct experiment that the characters and tests of the French Codex, 1908, are uneffective to detect the admixture of genuine *Eucalyptus globulus* oil with 10 per cent. of the following adulterants: Swedish pine oil, Scandinavian pine oil, camphor oil, cedarwood oil, French turpentine oil, light petroleum oil, kerosene.

Galenical Preparations and their Active Principles, Relation between. H. A. D. Jowett. (*Pharm. J.*, 1913 [4], **36**, 362, 400.) The author deals with the subject of the relative therapeutic value of galenical preparations of active drugs, and of their active principles, and classes them under four heads: (1) Those of which the galenical preparations can be replaced adequately by the active principle or combination of principles; such are jaborandi, physostigma, coca and ergot. (2) Those in which, although the active principle or principles have been isolated and investigated, there is still doubt as to whether these represent the full activity of the galenical preparations; such are opium, cinchona and the solanaceous group of drugs (belladonna, hyoscyamus, etc.). (3) Drugs whose pharmacological action can be accurately ascribed to one or more active principles, but where the presence of pharmacologically inactive substances affects the physical properties of the active principles so as to give the galenical preparations advantages not possessed by solutions of the active principle—e.g., nux vomica and digitalis. (4) Drugs whose pharmacological action cannot be ascribed to any principles which have been isolated therefrom—e.g., purgative drugs generally, cannabis Indica.

After dealing in detail with the investigations of others and

his own work, the author quotes the following final sentence from the Presidential address of Naylor (*Y.B.*, **1905,** 373) :—

"My belief is that the extractive form of galenicals, both solid and liquid, will be used increasingly by the medical profession if pharmacists take pains to equip themselves for the successful investigation of problems connected with the chemistry of drugs."

The opinion is expressed that while the sole use of active principles either singly or in combination is the ideal state of administration of such remedies, it is, at the present time, in the majority of cases impracticable. Much investigation remains to be carried out before this ideal can be attained, and in this work pharmacy and pharmaceutical chemistry must take a considerable share.

Iodine Ointment. A. N. D. Pullen. (*Pharm. J.*, 1912 [4], **35,** 610.) As may be foreseen by its constitution, iodine ointment rapidly loses free iodine, due to the iodine absorption of the lard. When old lard is used as the basis the amount of I absorbed is distinctly greater in a given time, than when fresh lard is used. Immediately after mixing the ointment made with fresh lard contained 3·95 per cent. of I ; that with old lard, 3·38 per cent. Figures are given of periodical determinations of each, during four months. At the end of that period the fresh lard ointment contained 2·92 per cent. of I and that made from old lard 2·26 per cent. Samples of iodine ointment purchased ranged in I content from 2·48 to 2·85 per cent. The presence of the KI has a useful action in retarding the absorption of the I by the fat. A sample mixture of lard with I, 4 : 100, loses free I so rapidly, that in a few hours only 5 per cent. of the I originally added remains in a free state.

Hydrastis Liquid Extract. K. Kunze. (*Apoth. Zeit.*, 1913, **28.**) Attention is called to the fact that the liquid extract of hydrastis of the Ph.G.V. is not permanent. A batch originally assaying 2·86 per cent. of hydrastine only gave 2·19 per cent. in 12 months. The loss may be lessened by increasing the alcohol strength of the menstruum. It has also been suggested that the addition of 0·1 to 0·2 per cent. of tartaric acid will prevent the separation of hydrastine.

Hydrocyanic Acid, Stability of, under Different Conditions of Exposure. R. C. Cowley. (*Austral. Pharm. Conf.;*

Austr. Journ. Pharm., 1913, **28**, 37.) The loss of HCN when the acid is stored in bulk is not so rapid as is generally supposed. The practice of storing the acid in small phials is wrong, as this favours decomposition. A specimen of acid assaying 4·537 per cent. of HCN on April 6, 1912, was stored in a pint bottle partially filled, and examined about once a month. On December 2, 1912, it contained 4·2916 per cent. On the same day, when the temperature stood at 33°C., the cork was removed from the bottle for 1 hour. At the end of this time the solution contained 4·253 per cent. of HCN.

Some of the original solution of hydrocyanic acid was on April 11 diluted to contain 2 per cent., the B.P. strength. On November 7 it contained 1·9665 per cent., after being opened from time to time.

Small quantities were exposed in an open vessel at a temperature of 29·5°C., and assayed. After a 10 minutes exposure it contained 1·680 per cent. HCN; in 30 minutes it contained 1·3245 per cent., and after 1 hour 0·8734 per cent. at a temperature of 29·5°C.

When the temperature was 29°C., a solution of hydrocyanic acid, assaying 1·948 per cent., after exposure in a 1 oz. bottle unstoppered for 1 hour, was found to contain 1·793 per cent. The same sample, assaying 1·948 per cent., after exposure in a 1 pound bottle partially filled and uncorked at a temperature of 29°C., assayed 1·892 per cent. HCN. A sample containing 2 per cent. HCN after exposure in a 1 pound bottle, partially filled, and uncorked at a temperature of 31°C., assayed 1·969 per cent. HCN.

Hypophosphite Syrups, U.S.P. Suggested Modification of. S. K. Sass. (*J. Amer. Pharm. Assoc.*, 1912, **1**, 1251.) *Syrup of Hypophosphites.* When made according to the formula of the U.S.P. this preparation will not keep. When finished it is not of the U.S.P. strength, as some of the hypophosphites are precipitated and left in the filter.

The following alternative formula is suggested: Calcium hypophosphite, 45 Gm.; potassium hypophosphite, 15 Gm.; sodium hypophosphite, 15 Gm.; diluted hypophosphorous acid, 2 Gm.; sugar, 640 Gm.; lactic acid, 1·25 Gm.; water, a sufficient quantity to make 1,000 c.c.

Dissolve the hypophosphites in 450 c.c. water, add the diluted hypophorphorous acid, the lactic acid, and the sugar, which dissolve by agitation, and add enough water to make the product

measure 1,000 c.c. Filter and keep in a glass container, well corked.

Compound Syrup of Hypophosphites.—The U.S.P. formula requires an increase in the amount of sugar called for and a re-arrangement of the directions. If these corrections are made as follows, a most satisfactory preparation will result: Calcium hypophosphite, 35 Gm.; potassium hypophosphite, 17·50 Gm.; sodium hypophosphite, 17·50 Gm.; ferric hypophosphite, 2·25 Gm.; manganese hypophosphite, 2·25 Gm.; quinine, 1·10 Gm.; strychnine, 0·115 Gm.; sodium citrate, 3·75 Gm.; diluted hypophosphorous acid, 15 c.c.; sugar, 815 Gm.; water, a sufficient quantity to make 1,000 c.c.

Dissolve the calcium potassium and sodium hypophosphites in 375 c.c. of water, to which 5 c.c. of diluted hypophosphorous acid has been previously added. Dissolve the quinine and strychnine in 30 c.c. of water, to which 10 c.c. of diluted hypophosphorous acid has been previously added. Rub the ferric and manganese hypophosphites with the sodium citrate, add 30 c.c. of water and warm the mixture on a water-bath, stirring continuously until the salts are dissolved and a clear greenish solution is obtained. Mix the three solutions in the order named. Dissolve the sugar by the aid of a water-bath, stirring continuously. As soon as the sugar is dissolved remove the syrup from the water-bath and filter. Finally add enough water through the filter to make the product measure 1,000 c.c. In the northern latitudes and during the cold season the sugar may be reduced to 805 or 810 Gm.

Liquor Ferri Iodi pro Syrupo U.S.P. G. M. Beringer. (*Amer. J. Pharm.*, 1913, **85,** 195.) The following is an improved method for preparing this liquor. It contains approximately 107·8 Gm. of FeI_2 in 100 c.c. Fine, bright, iron wire, cut into small pieces, 250 Gm.; iodine, 884 Gm.; hypophosphorous acid, 30 per cent. acid, 140 c.c.; glycerin, 100 c.c.; distilled water, a sufficient quantity to make 1,000 c.c.

To the iron, contained in a flat bottom flask, add 1,000 c.c. of distilled water, then gradually add the iodine, keeping the temperature down by setting the flask in a vessel of cold water. When the iodine has all been added, allow the mixture to stand for 12 hours, then heat to boiling until the clear liquid is of a bright green colour. Then cool the solution and filter through a double filter paper and wash the flask and iron residue with

several portions of distilled water and pass the washings through the filter. Add the glycerin to the filtered solution and rapidly evaporate in a porcelain dish on a sand bath to about 850 c.c. Allow the solution to cool to 90°C., then add the hypophosphorous acid, mix thoroughly and when cold add sufficient distilled water to make 1,000 c.c.

The finished product should be kept in small glass-stoppered bottles entirely filled. It is an emerald green liquid, sp. gr. about 1·9. Syrup of ferrous iodide, U.S.P., made by diluting 1 volume of this liquid with 15 volumes of syrup, showed a specific gravity of 1·35, thus practically tallying with the U.S.P. sp. gr. of syrup of iron iodide. [*Syrup Ferri Iodi, U.S.P.*, is practically half the strength in FeI_2 of the B.P. syrup.—Ed., *Y.B.*]

Liquor Sodii Phosphatis Co., U.S.P. M. Bernstein. (*Amer. J. Pharm.*, 1913, **84,** 399.) It is stated that the substitution of the equivalent of anhydrous sodium phosphate for the official salt, prevents the formation of crystals in this preparation, which is at present troublesome. Care should be taken that the dried salt is really anhydrous, as in one case a commercial specimen contained 40·5 per cent. of water, and in another, 17·5 per cent. The following is the proposed formula: Sodium nitrate, 40 Gm.; citric acid, 130 Gm.; anhydrous sodium phosphate, 396·6 Gm.; distilled water to make 1,000 c.c.

Add the citric acid and sodium nitrate to 150 c.c. of distilled water contained in a flask, then add the anhydrous sodium phosphate. Dissolve by the aid of heat of water-bath. Make volume up to 1,000 c.c. and filter while warm into a sterilized container stoppered with a sterile plug of absorbent cotton.

Morphinometric Assay of Opium, Amendments to the U.S.P: Method for. R. N. Shreve. (*J. Ind. Eng. Chem.*, 1912, **4,** 514.) With some opiums the U.S.P. process does not completely extract the morphine; a test to ensure the complete exhaustion of the marc should be therefore inserted. A correction for the solubility of morphine in the mother liquors of crystallization should be made. The purity of the morphine weighed should be determined. This may be done as follows: Morphine up to 2 Gm. is mixed with 0·5 Gm. of freshly slaked lime, and 18 c.c. of water added, rotated occasionally during half an hour, filtered without suction (suction causes foaming), and washed with lime water until the filtrate weighs 35 Gm.; 3 c.c. of EtOH added, flask rotated; 20 c.c. of Et_2O added,

flask rotated again; finally 0·5 Gm. of AmCl and the flask shaken for 10 minutes; set aside for 2 hours (or over night) for the morphine to precipitate. Morphine filtered and washed, in the manner which the U.S.P. directs in case of the crude morphine. Correction for the morphine soluble in alcoholic mother liquors is determined by blank assay on pure morphine.

Morphinometric Methods of the French Codex, Correction for Solubility of Morphine in. A. Leclère. (*J. Pharm. Chim.*, 1913, **7,** 521.) The official method for the determination of morphine in opium and its preparations gives too low results, since no correction is made for the solubility of morphine in the alkaline filtrate from the crystallization of the alkaloid. The author has determined the amount of morphine thus lost, which is 31 Mgm. for the 50 c.c. of filtrate resulting from the official method. If this correction be made the method will give satisfactory results. The same correction should obviously be made in the morphinometric valuation of the galenical preparations of opium.

Ointments, Pharmacopœial. E. W. Lucas. (*Chem. and Drugg.*, 1913, **82,** 438.) Comments of correspondents on the amended formulae originally suggested by the author (*Y.B.*, **1912,** 344) are discussed.

Opium and its Preparations in Various Pharmacopœias. E. Collard, fils. (*L'Union Pharm.*, 1913, **54,** 119.) *Opium.*—Comparative results are obtainable only among themselves with methods which extract all the morphine by means of $Ca(OH)_2$ solution, and liberate it from the solution by adding AmCl to form AmOH. The results obtained are invariably higher than those obtained by merely extracting the opium with water, since the latter does not remove all the morphine from the marc. Another cause of difference is due to the fact that in some methods the morphine is determined volumetrically as the anhydrous base, with a molecular weight of 285; in other processes it is dried at 100°C. and weighed. Since it then contains 1 mol. H_2O its molecular weight is 303.

Extract of Opium.—The U.S.P. method is the only one to thoroughly extract the opium; consequently, the yield of extractive is less. The yield further varies if the first obtained extract is again extracted with water. Where the standardizing assay of the opium is made by a $Ca(OH)_2$ method, it cannot be

expected to extract a corresponding amount of morphine by mere water extraction, so as to obtain an extract having the theoretical ratio of extractive and morphine. It is only the "soluble morphine" which will be present in the aqueous extract. Opium extract dried at 60°C. or at 100°C. is hygroscopic. Ordinary solid extract loses water on keeping, and becomes hard. *Tincture of opium* is best prepared by percolation with alcohol 70 per cent. *Tincture of opium with saffron.* The International Convention at Brussels decided that this should contain 1 : 100 of morphine. It cannot be made of this strength by using an official standardized opium : the opium must contain at least 13 per cent. of morphine to enable the tincture to yield 1 per cent. *Compound Tincture of Camphor.*—The differences in the proportions of the various ingredients, in different pharmacopœias, is very marked and should be rendered uniform.

Opium Extract of the French Codex. — Debourdeaux. (*J. Pharm. Chim.*, 1912, **6**, 542.) The French Codex, **1908**, requires extract of opium to be firm, containing 15 to 20 per cent. of moisture and 20 per cent. of morphine. With standardized powdered opium containing 10 per cent. of morphine, the required morphine strength in the extract can only be got if the moisture in the latter does not exceed 16 per cent. But if it yields more than 42 per cent. of extractive it will not be possible to obtain an extract of the official morphine strength unless the original powdered opium contains more than 10 per cent. of morphine. Many powdered opiums give more than 42 per cent. of extractive. A powdered opium containing 10 per cent. of morphine gave 50 per cent. of extract, which contained but 15 per cent. of moisture and 17·4 per cent. of morphine. In other words, the official extract with 20 per cent. of morphine can only be obtained by using powdered opium exceeding the official standard for morphine. The morphine in the extract from the standardized powder will be too low for two reasons: (1) The opium itself will yield more than 42 per cent. of "firm extract." (2) The whole of the morphine will not be extracted by the official process. Only the soluble morphine will be extracted.

Organic Salts of K and Na, Method of Assay of, in the U.S.P. E. Elvove. (*Amer. J. Pharm.*, 1912, **84**, 290.) Instead of the present method of conversion into alkali carbonates and

subsequent titration, the author converts the salts into alkali sulphate, which is then ignited and weighed as Na_2SO_4 or K_2SO_4. About 0·5 Gm. of the material is treated in a Pt dish with excess of N/H_2SO_4, then evaporated to dryness, dried from 100 to 150°C. and ignited to constant weight. Eleven commercial samples of potassium citrate gave from 97·21 to 99·95 per cent. of $K_3C_6H_5O_7 \cdot H_2O$; 12 samples of potassium bitartrate, from 99· to 100 per cent. of $KHC_4H_4O_6$; 10 of Rochelle salt, from 96·96 to 99·96 of $KNaC_4H_4O_6 \cdot {}_4H_2O$; 12 of potassium acetate, from 90·90 to 99·83 per cent. of $KC_4H_3O_2$; 9 of sodium benzoate from 85·72 to 99·07 per cent. of $NaC_7H_5O_2$; 9 of sodium citrate from 80·66 to 99·77 per cent. of $2Na_3C_6H_5O_7 + 11H_2O$; 10 of sodium salicylate from 95·99 to 100 per cent. of $NaC_7H_5O_3$; and 12 of sodium acetate from 99·2 to 99·96 per cent. of $NaC_2H_3O_2 \cdot 3H_2O$. In the case of sodium benzoate it would appear that there is a difficulty in obtaining a preparation of the official standard 99 per cent. of the salt. Possibly a standard of 98 per cent. would be more easily attained. In the case of sodium citrate, however, there appears to be no difficulty in preparing the salt to contain 99 per cent. Consequently, the official standard of 97 per cent. is too low.

Paraffin Ointment, Suggested Modifications of. A. Bagley. (*Chem. and Drugg.*, 1912, **81,** 492.) The following modification of the proposed formulae for this ointment are suggested as giving preparations suitable for a winter temperature of 37° to 52°F. and a summer temperature of 80° to 90°F. For summer requirements: hard paraffin, 27; soft paraffin, 90; beeswax, 3; and for winter: hard paraffin, 27; soft paraffin, 110 to 120; beeswax, 3.

Pepsin Wine, to Clarify. O. Richter. (*Apoth. Zeit.*, 1913, **28,** [40].) The use of milk as a clarifying agent is recommended for pepsin wine which will not filter bright. About 2 per cent. is added for small volumes of wine; for larger amounts, relatively less milk is needed. After agitation the mixture is allowed to stand for 2 or 3 hours, then filtered, the first runnings being poured back until the filtrate is quite bright.

Pharmacopœial Nomenclature, International Standards for. M. I. Wilbert. (*Amer. Drugg.*, 1913, **61,** 27.) The author advocates the adoption of a single title, at least for the Latin synonym of drugs. Quininae sulphas at present has 6 other

Latin synonyms in pharmacopœias; Potassii bromidum has 4; Borax has 6 others, and Sodii chloridum 5 other titles.

Pharmacopœial Nomenclature, Necessity for Uniformity in. G. P. Forrester. (*Amer. Drugg.*, 1913, **61,** 157.) A plea for uniformity, illustrated specially by the divergent nomenclature of the various pharmacopœias, for the acids and alkalies. In international dispensing this want of uniformity is the source of much trouble and confusion.

Spirit of Nitrous Ether, Deterioration of. R. C. Cowley. (*Proc. Austral. Pharm. Conf.: Australas. J. Pharm.*, 1913, **28,** 19.) In hot climates, such as that of South Queensland, ethyl nitrite can only be kept in sealed ampoules. Solutions of ethyl nitrite deteriorate by evaporation, by spontaneous decomposition and by hydrolysis. Hydrolysis occurs so rapidly that it is stated to be practically useless to prescribe ethyl nitrite in aqueous solutions; it should be diluted immediately before administration. The official liquor keeps better than the spirit, as proved by a series of monthly determinations. In the process of assay, it is important that the sample should be pipetted direct from the bottle, or low results will be obtained. Exposure to the air causes very rapid volatilization of $EtNO_2$. Spirit of nitrous ether, which yielded 20·4 c.c. of nitric oxide from 5 c.c. at 20·5°C., after standing exposed in an open vessel for 15 minutes yielded 16·2 c.c. of NO, and after exposure for 1 hour 13 c.c. of this gas. Another commercial sample, which yielded from 5 c.c. 23·3 c.c. of NO at 22·8°C., after standing for 1 hour exposed yielded only 9·3 c.c. of gas. Stronger solutions of $EtNO_2$ deteriorate proportionately more rapidly. Deterioration of solutions of $EtNO_2$ is chiefly due to evaporation, and the smaller loss observed in the case of liquor ethyl nitrites is due to the greater viscosity of the solvent. Three solutions containing 3 per cent. by weight of $EtNO_2$ were prepared: No. 1, 5 volumes glycerin to 95 volumes of absolute alcohol, B.P. No. 2, 1 volume of glycerin to 2 volumes of absolute alcohol. No. 3, equal volumes of absolute alcohol and glycerin. The volumes of NO obtained from 5 c.c. of each at 21°C., without undue exposure were: No. 1, 38·2 c.c.; No. 2, 42·0 c.c.; No. 3, 45 c.c. After exposure for 1 hour the results were with No. 1, 12 c.c.; No. 2, 21 c.c.; No. 3, 29·2 c.c. In the case of spirit of nitrous ether similar improvement in the keeping properties

of the preparation were obtained in a medium of equal volumes of absolute EtOH and glycerin.

It is recommended that in the next edition of the B.P. the solvent for the $EtNO_2$ preparations should be composed of equal volumes of EtOH and glycerin, and that this medium should be placed in the receiver during the process of distillation of Spirit Ether. Nit. inst ad of the alcohol 90 per cent. at present used. (See also *Y.B.*, **1907,** 454 ; **1911,** 422 ; **1912,** 335, 337, and *Gen. Index.*)

Strophanthus Tincture, Preparation of. P. Siedler. (*Apoth. Zeit.*, 1913, **28,** 230.) Powdered strophanthus should first be rendered fat-free by means of petroleum ether, which removes from 31·4 to 32·3 of fat, before being used for tincture. This solvent removes only fat ; Et_2O removes other constituents as well. (See also *Y.B.*, **1911,** 126.)

Strophanthus Tincture, Preparation of. R. C. Holmes. (*J. Amer. Pharm. Assoc.*, 1913, **2,** 713.) Tincture of strophanthus prepared from seeds previously deprived of fixed oil by extraction with petroleum ether is preferable to the tincture made from the seeds directly. The oil removed has no valuable therapeutic properties, but from experiments performed on dogs, the reverse.

Syrup of Wild Cherry, Disappearance of HCN from. J. G. French. (*Amer. J. Pharm.*, 1913, **85,** 82.) HCN disappears from this syrup in 3 to 4 months after making.

Sydenham's Laudanum, Instability of. —Debourdeaux. (*J. Pharm. Chim.*, 1912, **6,** 544.) In the case of Sydenham's laudanum, *Vinum opii compositum* of the French Codex, percolation gives a much more complete extraction of the morphine than maceration. The marc of the latter process contains practically all the "insoluble" morphine of the original opium, whereas the percolation marc contains only a trace. The completed laudanum is unstable. It gradually loses its morphine. A specimen yielding 1·024 per cent. in 1908 gave only 0·851 per cent. in 1912. It is found that presence of air increases this loss. Exposed to the air and occasionally stirred, then made up to its original weight and assayed, in one instance the morphine content fell from 1·071 per cent. to 0·883 per cent.

Tincture of Iodine, Keeping Properties of. L. Johan-

nessen. (*Farmac. Tidende*, 1912 [46]; *Pharm. Zentralh.*, 1913, **54,** 221.) Experiments show that the addition of KI (as in the B.P.) has an important and effective influence in preserving the I in the free state and preventing the formation of HI. Tincture of iodine containing 10·01 per cent. of I and 0·03 per cent. of HI when first made, gave 8·3 per cent. of I and 1·69 per cent. of HI in 15 days at 37°C. The same, with the addition of 1 : 20 of KI, gave 10·01 of I and 0·05 HI under like conditions of time and temperature. (See also *Y.B.*, **1910,** 259; **1911,** 295.)

Zinc Oxide Ointment. J. F. McAnulty, junr. (*Merck's Report; Canad. P.J.*, 1913, **46,** 354.) An ointment of improved appearance may be obtained if the ZnO be first heated in an oven for 30 minutes, and then sifted very fine into the melted lard, stirring continuously.

NOTES AND FORMULÆ

Antiseptic Naphthol Solution. J. C. Dills. (*Drugg. Circ.*, 1913, **87,** 323.) To a 15 per cent. solution of α-naphthol in glycerin 5 per cent. of NaOH is added. The product is an active antiseptic, which mixes bright with hard water, and does not affect surgical instruments. It is relatively non-toxic except in large doses, and therefore well suited for use for the domestic preparation of antiseptic washes. To render it more distinctive, a few drops of phenolphthalein may be added. It keeps well in yellow bottles, but darkens when exposed to the light.

Bath Salts. (*Amer. Drugg.*, 1912, **60,** 527.) *Acid bath salt.*—Sodium bicarbonate, 4 parts; sodium acid sulphate, 6 parts; oil of lavender, sufficient. Dry the salts, reduce to a fine powder, and incorporate sufficient oil of lavender to perfume, usually about 1 drachm to 10 pounds of mixed salts; mix thoroughly and put up in air-tight containers. Four oz. of this mixture are sufficient for the average bath of 25 to 30 gallons of water, which should be as hot as can be borne.

Alkaline bath salt.—Soda ash, 6 parts; sodium chloride, 8 parts; sodium sulphate, 2 parts. Dry and reduce the salts to a coarse powder and mix thoroughly. An oz., or a couple of heaping tablespoonfuls, of this salt will give the proper

alkalinity to a bath of from 25 to 30 gallons of water. The water should not be hot, but at about 100°F. *Reducing bath salts.*—Potassium chloride, 40 parts; potassium iodide, 5 parts; potassium bromide, 20 parts; calcium chloride, 600 parts; magnesium chloride, 50 parts; sodium chloride, 1,000 parts. Reduce the salts to coarse powder and dry them before mixing. Store in dry, air-tight packages. This salt is sometimes called "Iodobromide Bathing Salts." It should be used in the proportion of 1 oz. to the average bath, 25 to 30 gallons of water.

Bath powder.—Sodium bicarbonate, 1 part; borax, 2 parts; perfume, sufficient. Use 1 or 2 teaspoonfuls in the bath.

Bath powder perfume.—Oil of lavender, 1 fl.oz.; oil of bergamot, 1 fl. oz.; oil of lemon, 1 fl. oz.; oil of cloves, 1 drachm; oil of cinnamon, 1 drachm; alcohol, to make 16 fl. oz. Use 1 oz. to 10 lbs. of bath powder. (See also *Y.B.*, **1906,** 224, 286; **1909,** 173; **1911,** 252, 344.)

Blackboards, Liquid Slating for. (*Nat. Drugg.*, 1913, **43,** 147.) An excellent substitute for slate is prepared as follows: 10 parts of borax dissolved in 150 parts of water is heated to boiling; 40 parts of orange shellac in powder added. Under continued boiling the shellac soon dissolves, whereupon 25 parts of finest powdered pumice stone is added. In the course of a few minutes add 10 parts of lampblack, previously moistened with some of the boiling liquid, and stir until it is evenly distributed. The liquid is now strained through a fine sieve, and is ready for use. It may be used on wood, metals or pasteboard, and even on a plastered wall applied with a paint brush. It may be applied with a soft, flat brush.

Bouillie Bordelaise, Simple Test for Efficacy of. — Crouzel. (*Annales Chim. Analyt.*, 1912, **17,** 409.) A 1 : 1,000 aqueous solution of fluorescein affords a simple and effective means of ensuring the presence of the due excess of $Ca(OH)_2$ in Bordeaux mixture, and similar copper horticultural insecticides and fungicides. A little of this, mixed in a glass with some of the bouillie bordelaise, and allowed to stand, should retain its fluorescence and show a bright green annulus at the meniscus. If the liquid is yellow, without fluorescence, it indicates that the $CuSO_4$ is in excess. More $Ca(OH)_2$ must be added to the original until the fluorescent ring is evident. The application of mixtures containing $CuSO_4$, as such, causes very

serious damage to vines and other fruit trees, since it acts as a strong caustic. Consequently a simple test, such as the above, which can be applied by the horticulturist, without apparatus, is very valuable.

Camphorated Jelly. (*Pharm. Zentralh.*, 1913, **54,** 205.) White gelatin, 5 ; camphorated spirit, 10 ; boric acid, 10 ; glycerin, 80 ; distilled water, 80. Soften the gelatin in water and melt it on the water-bath in a tared dish. Evaporate to 80, and add the glycerin in which the boric acid has been dissolved, and lastly the spirit of camphor.

Catheter Lubricant. E. Portner. (*Apoth. Zeit.*, 1913, **28,** 51 ; *Med. Klin.*, 1913, 66.) Powdered tragacanth, 2·5 Gm. ; glycerin, 10 Gm. ; mercury oxycyanide, 0·20 Gm. ; distilled water to 100 Gm. Mix to form a soft paste, sterilize, and store in collapsible tubes. (See also *Y.B.*, **1904,** 265, 277, 298 ; **1911,** 267.)

Celluloid Label Varnish. (*Drugg. Circ.*, 193, **57,** 25.) Celluloid (transparent base), 10 ; camphor, 4 ; ether, 30 ; acetone, 30 ; amyl acetate, 30.

Cement for Marble. (*Amer. Drugg.*, 1913, **61,** 83.) An excellent cement for broken marble counter tops, side pieces, etc., may be made by this recipe : Plaster of Paris, 4 ; gum arabic, 1 ; borax, 2 ; water, sufficient to make a paste.

Use enough water to make a saturated solution of the borax, mix the gum arabic and plaster of Paris (in fine powder) together intimately, then add the solution of borax with constant working until a doughlike mass is formed, thin enough to work easily. This cement must be made freshly and used at once. To cement the broken pieces of marble together, first wash the edges free from all dirt and grease, then apply the cement thickly to the surfaces of the parts to be joined together and fasten the pieces in as close contact as possible, allowing any excess of cement to remain until the joints have set, after which it can be scraped off without weakening the adhesion. To secure best results the broken pieces of marble should be clamped together as firmly as possible and the cement allowed to set for two or three days before moving it. In case of coloured marble, a small quantity of mineral colour, such as oxide of iron, may be added to the cement to make the repair less notice-

able. By adding water-soluble aniline dyes to the solution of borax and working the paste while fresh into slabs or sheets on a backing of wood or metal, excellent imitations of coloured marbles may be made for temporary decorations.

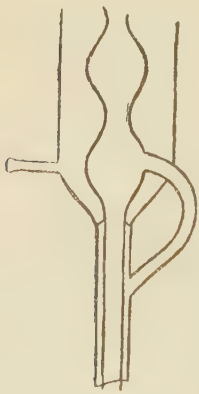
Chap Cerate. (*Drugg. Circ.*, 1912, **56,** 730.) Salol, 1 ; peach kernel oil, 8 ; white wax, 4 ; suet, 3 ; solution of heliotropin, enough to perfume. Melt the wax and suet in the oil ; add the salol ; stir gently until cool ; then add the perfume.

Chinosol Toilet and Cosmetic Preparations. (*Seifenfab.*, 1913 [22] ; *Pharm. Zeit.*, 1913, **58,** 447.) It is claimed that the active bactericidal properties of chinosol, with its relative low toxicity, render it eminently suitable for use for mouth washes, tooth pastes and other toilet preparations. The following are typical formulae. *Chinosol mouth wash.*—Alcohol, 90 per cent., 10,000 ; tincture of myrrh, 200 ; Mitcham peppermint oil, 80 ; staranise oil, 20 ; clove oil, 3 ; chinosol, 75 ; water, 3,000. Dissolve the chinosol in the water, the other ingredients in the spirit, and mix. *Chinosol tooth powder.*—Finest precipitated chalk, 10,000 ; chinosol, dissolved in a little water, 50 ; peppermint oil, 120 ; clove oil, 10 ; Ceylon cinnamon oil, 1. Mix thoroughly by repeated sifting. *Chinosol tooth paste.*—Finest precipitated chalk, 7,000 ; soft soap, 200 ; distilled water, 1,100 ; simple syrup, 1,000 ; glycerin, 600 ; chinosol, 300 ; peppermint oil, 100 ; clove oil, 15. Dissolve the chinosol in the water. Rub the oils down with the powders. Mix the chinosol solution with the syrup and glycerin and mass the powders with the mixture. *Chinosol lanolin salve.*—Wool fat, 1,500 ; rose-water, 1,000 ; white vaseline oil, 350 ; chinosol, 90 ; beeswax, 400 ; artificial geranium oil, 40 ; artificial bergamot oil, 20 ; vanillin, 3. *Chinosol vaseline.*—White vaseline, 1,000 ; chinosol, 5 ; bergamot oil, 10. *Chinosol cold cream* may be made by adding a little menthol and 1 per cent. of boric acid to the above chinosol vaseline, and adding to the above quantity about 10 parts of the following perfume : Artificial rose oil, 10 ; artificial bergamot oil, 30 ; terpineol, 100 ; vanillin, 2. *Chinosol antiseptic toilet water for the hands.*—Distilled water, 3,000 ; alcohol, 90 per cent., 6,000 ; liquid soap, 200 ; chinosol, 15 ; terpineol, 10 ; artificial lemon oil, 10 ; artificial bergamot oil, 30 ; artificial neroli, 5. To be used to rub on the hands, which are then allowed to partially dry, then rinsing in clean water. *Chinosol hair*

wash.—Alcohol, 90 per cent., 10,000 ; castor oil, 750 ; chinosol, 200 ; rose-water, 800 ; artificial ylanylang oil, 5 ; carnatia, 20 ; artificial bergamot, 25 ; geranin, 15 ; vanillin, 2 ; simple tincture of benzoin, 100.

Cold Cream, Permanent. (*Amer. Drugg.*, 1913, **61,** 48.) White wax, 150 Gm. ; spermaceti, 75 Gm. ; petrolatum, liquid white, 600 c.c. ; menthol, 2 Gm. ; camphor, 2 Gm. ; borax, 10 Gm. ; water, 250 c.c.

Dissolve the wax and spermaceti in the liquid petrolatum by aid of gentle heat, then add the menthol and camphor previously triturated together until a pasty fluid is formed. Dissolve the borax in the water warmed to about the same temperature as the petrolatum mixture and add this solution to the other portion of the cold cream. Stir vigorously and remove from the source of heat and continue the stirring (best with an egg beater) until the mass is cold. This makes a fine white cream which will keep indefinitely without becoming rancid. By omitting the camphor and menthol and adding a few drops of oil of rose geranium an elegant "cold cream" can be made, or, synthetic oil of lilac or violet may be used as a perfume. (See also *Y.B.*, **1904,** 268 ; **1905,** 246, 277 ; **1907,** 278, 279 ; **1909,** 175, and *Gen. Index.*)



Condenser, Improved, for Flow-back or Distillation. F. Michel. (*Apoth. Zeit.*, 1913, **28,** 339.) The sketch explains the advantages of the apparatus ; the side tube preventing the contact of descending condensed liquid and hot ascending vapour. It has a much more efficient condensing power, and is therefore shorter and more compact than the ordinary form.

Condenser, New Form of. C. Woytacek. (*Pharm. Zentralh.*, 1913, **54,** 89.) This is one of the latest developments of the many modifications of the Liebig's condenser. It is claimed to have a maximum cooling surface and to be compact and efficient. (See p. 369.)

Cosmetic Lotions and Skin Preparations. (*J. Amer. Pharm. Assoc.*, 1912, **1,** 1307.) *Lotio amygdalae composita.*—Mercuric

chloride, 0·06 Gm.; AmCl, 0·5 Gm.; bitter almond mixture to make 100 c.c. Dissolve. Used as a peeling lotion for freckles. The $HgCl_2$ is sometimes increased gradually; but this must be done with caution. *Mistura amygdalae amarae.*—Bitter almonds, 7·5 Gm.; distilled water to make 100 c.c. Blanch the almonds and triturate to a thin paste; then add sufficient distilled water

(*See p.* 368).

to make up to 100 c.c. and strain. This is used as a basis for skin lotions, and must not be confused with emulsion of almond, which is made from sweet almonds, and containing acacia, is quite unsuited for toilet lotions. *Lotio amygdalae et bismuthi.*—Bismuth subnitrate, 6 Gm.; diluted hydrocyanic acid, 2 c.c.; bitter almond mixture to make 125 c.c. Mix well. Agitate before using. The quantity of diluted hydrocyanic acid is sometimes increased to 4 c.c. Used as an antipruritic for eczema, when skin is not broken. *Lotio calaminae et cretae.*—Calamine, 5 Gm.; prepared chalk, 5 Gm.; diluted hydrocyanic acid, 2 c.c.; glycerin, 15 c.c.; lime water, 100 c.c.; elder flower water, to make, 250 c.c. Triturate the prepared chalk and the calamine to a very fine powder, with the elder flower water and add the other ingredients. This is a cooling lotion used as an anti-pruritic in acute and subacute inflammation. *Aqua cosmetica lilionese.*—Purified talc, 100 Gm.; borax, 15 Gm.; potassium carbonate, 5 Gm.; glycerin, 50 c.c.; tincture of benzoin, cologne water, of each, 25 c.c.; rose-water, 900 c.c Dissolve the salts in the rose-water and add the cologne water. Triturate the purified talc, which should be in very fine powder, with the glycerin; add the tincture of benzoin and then gradually add the solution of the salts in the rose-water. *Aqua chloralo-tannata* (Captol substitute).—Chloral hydrate, 2 Gm.; tannin, 1 Gm.; tartaric acid, 1 Gm.; castor oil, 2 Gm.; alcohol, 90 per cent., 89 Gm.; essence of violets, 5 Gm. Dissolve the solids in the alcohol and add the perfume. *Aqua crinalis c. quininā* (*Eau de quinine hair wash*).—Quinine sulphate, 1 Gm.; Eau de Cologne, 10 Gm.; glycerin, 50 Gm.; rum, 100 Gm.; alcohol, 90 per cent., 150 Gm.; rose-

water, 600 Gm. (colour with liquid extract of red sandalwood). *Lotio glycerini borata.*—Boric acid, 2 Gm.; stronger rose-water, 50 Gm.; glycerin, 50 Gm. Dissolve. A lotion for chapped hands. *Lotio sulphuris composita.*—Precipitated sulphur, 5 Gm.; ether, 15 c.c.; alcohol, to make 125 c.c. Mix well. Keep in well stoppered bottles and agitate before using. Compound sulphur lotion is employed for acne, comedones and seborrhoea. *Lotio Phillipsoni* (Phillipson's mixture).—Glacial acetic acid, tincture of benzoin, spirit of camphor, of each, 6 c.c.; alcohol, to make, 100 c.c. Mix. Used in slight cases of excessive fat-secretion and its sequelae, by rubbing on face three times a day. *Aqua cosmetica orientalis, Hebra.*—Mercury bichloride, 0·5 Gm.; tincture of benzoin, 1 c.c.; bitter almond mixture, to make 100 c.c. Dissolve the $HgCl_2$ in the bitter almond mixture and add the tincture of benzoin. As this preparat'on deteriorates upon keeping, it should be freshly prepared. Agitate well before using. *Freckle lotion, Paschkis.*—Potassium carbonate, 60 Gm.; potassium chlorate, 20 Gm.; borax, 15 Gm.; sugar, 60 Gm.; glycerin, 150 Gm.; rose-water, 330 Gm.; orange flower water, 355 Gm. Dissolve. *Aqua cosmetica Hufelandi* (Hufeland's Schönheitswasser).—Bitter almond, 5 Gm.; orange flower water, rose-water, of each, 70 Gm.; borax, 6 Gm.; tincture of benzoin, 14 Gm. Emulsify the almonds in the rose-water, dissolve the borax and add the tincture, agitating well. *Aqua cosmetica alba* (Flüssige Weisse Schminke).—Lead carbonate, 50 Gm.; starch, talc, of each, 25 Gm.; rose water, 100 Gm.; orange flower water, 20 Gm. Triturate the solids to a very fine powder and mix well with the liquids. Inasmuch as basic lead carbonate might produce more or less toxic effects, especially if used for some time if there should be some abrasion of the skin, it is well to substitute the less poisonous ZnO or $ZnCO_3$. *Aqua cosmetica rubra* (Rotes Schönheitswasser).—White cosmetic water (as above), 220 Gm.; carmine, in fine powder, 0·3 Gm. Mix well. *Lotio contra pityriasis* (Lotio Cephalica, Scurf lotion).—Salicylic acid, 1 Gm.; glycerin, 5 Gm.; alcohol, 94 Gm. Dissolve. *Lotio glycerini borata* (Lac Glycerini—Glycerin Milch).—Mucilage of quince seed, 70 Gm. (prepared from 7 Gm.); soap, medicinal, 1 Gm.; alcohol, 68 per cent., 1·5 Gm.; boric acid, 2·5 Gm.; glycerin, 25 Gm.; oil of lavender flowers, 2 drops. Dissolve the soap in the alcohol and mix with the mucilage. Heat the glycerin and boric acid until dissolved, mix with the mucilage

and add the oil. *Lotio crinalis detergens* (Haar Waschwasser).—Borax, 5 Gm.; tincture of quillaja, 15 Gm.; rum, 30 Gm.; orange flower water, 150 Gm. *Lotio lanolni* (Lanolin Waschwasser. Lac lanolini).—Lanolin, 15 Gm.; rose-water, 150 Gm.; soap, in powder, 1 Gm.; borax, 1·5 Gm. Melt the lanolin on a water-bath, add the soap and the borax and incorporate the rose-water, which is best done by agitation in a bottle. *Lotio mentholis* (Shaving Lotion).—Menthol, 2·5 Gm.; tragacanth, 4 Gm.; glycerin, 12 Gm.; alcohol, 15 Gm.; water, 300 Gm. Allow the tragacanth to swell in the water so as to form a homogeneous mucilage. Add the glycerin and then the solution of the menthol in the alcohol. This preparation may be coloured pink. It is an excellent cooling lotion, especially after shaving. *Aqua cosmetica Viennensis* (Dr. Bernatzik's Eau Cosmétique de Vienne).—Almonds, 15 Gm.; orange flower water, rose-water, of each, 60 c.c.; borax, 1 Gm.; tincture of benzoin, 2 c.c. Blanch the almonds and make an emulsion.

Cough Syrup. J. E. Justice. (*Nat. Drugg.*, 1912, **42,** 525.) Chloroform, 4 c.c.; white pine bark, 32·4 Gm.; wild cherry bark, 32·4 Gm.; balm of gilead buds, 4·2 Gm.; spikenard root, 4·2 Gm.; sanguinaria, 3·1 Gm.; sassafras, 2·14 Gm.; menthol, ·108 Gm.; sugar, 340 Gm.; alcohol, 62·5 c.c.; water, simple syrup, each sufficient quantity to make 500 c.c.

Moisten the drugs in No. 20 or 30 powder with 100 c.c. of a menstruum, in proportion of 1 c.c. of alcohol to 7 of water, and macerate for 12 hours. Pack in a percolator and percolate with the same menstruum until 250 c.c. is obtained; in this dissolve the sugar. Strain and add the menthol, previously dissolved in the chloroform, and add enough simple syrup to make 500 c.c.

Cough Remedies, American. (*Amer. Drugg.*, 1912, **60,** 510.) *Bloodroot Expectorant.*—Fluid extract of bloodroot, 2 fl. oz.; fluid extract of cubebs, 1 fl. oz.; fluid extract of ipecac., 2 fl. dr.; camphorated tincture of opium, 2 fl. oz.; chloroform, 2 flr. dr.; glycerin, 4 fl. oz.; simple syrup or glucose syrup, to make 32 fl. oz. Mix the fluid extracts with 4 oz. of water, shake thoroughly and filter through talc or calcium phosphate until clear, then add 4 fl. oz. of glycerin and enough thin syrupy glucose or simple syrup to make 32 fl. oz., adding lastly 2 fl. drachms of chloroform. This preparation is very effective for children and is an excellent remedy for whooping cough and croup. The dose should be varied according to age, the adult dose being

usually a teaspoonful. The proportion of opium is so small as to be negligible; the paregoric is used chiefly for its flavour and the camphor it contains.

Wild Cherry Balsam.—Wild cherry bark, 1 oz.; licorice root, 1 oz.; ipecac. root, ½ oz.; bloodroot, 1 dr.; sassafras bark, 1 dr.; fluid extract of cubebs, 4 fl. dr.; chloroform, 1 fl. dr.; alcohol, water, sugar, sufficient. Reduce the drugs to a moderately fine powder, moisten with a menstruum of 25 per cent. alcohol and pack lightly in a percolator. After 4 or 5 hours' start percolation with 8 fl. oz. of 25 per cent. alcohol to which the fluid extract of cubebs has been added and percolate slowly, with addition of sufficient menstruum, until 10 fl. oz. of percolate have been obtained, which should be clear. Dissolve ½ oz. of ammonium chloride in this percolate and ½ pound of sugar, lastly adding the chloroform and enough syrup, if necessary, to make 16 fl. oz. This cough syrup contains no opium and very little alcohol, practically less than 2 oz. in a pint. The dose is a teaspoonful for adults and less for children, as to age.

Tolu, Tar and Cherry Cough Syrup.—Tincture of tolu, 1 fl. oz.; fluid extract of ipecac., 1 fl. dr.; white pine bark, 1 oz.; wild cherry bark, 1 oz.; pine tar, 1 dr.; alcohol, water, sugar, sufficient.

Mix the ground drugs with the tar, distributing it as thoroughly as possible, then moisten these with the mixture of fluid extract of ipecac. and the tincture of tolu; pack in a percolator and let stand for several hours. Percolate with a menstruum of 25 per cent. alcohol until 18 fl. oz. of clear percolate have been obtained, dissolve 1 oz. of AmCl in this percolate and 22 oz. of sugar, to make a thick, heavy syrup, finally adding 3 fl. oz. of glycerin. If a flavouring is desired a few drops of bitter almond oil may be added to accentuate the wild cherry taste. This cough mixture is free from opium and contains but little alcohol. The dose is a teaspoonful for adults every 3 or 4 hours, less for children.

German Cough Syrup.- Ammonium chloride, 1 oz.; extract of licorice, 2 oz.; oil of anise, 10 minims; sugar, 20 oz.; water, sufficient to make 32 fl. oz. Dissolve the extract of licorice in the water, heating it to about 100°F., then the ammonium chloride, last the sugar. This prescription, although simple, is one of the standard prescriptions for ordinary coughs both in the United States and German armies and

navies. It has the merit of promoting expectoration without affecting other functions of the body, and as it is practically harmless can be used freely. Of course if used in excess nausea may be caused. If a sedative action is necessary $\frac{1}{8}$ of a grain of codeine phosphate or sulphate may be added to each fl. dr. of the mixture, or $\frac{1}{16}$ of a grain of heroin.

Dentifrice Powders and their Constituents. J. Head. (*Mid. Drugg.*, 1913, **47,** 5.) The author condemns all tooth powders containing gritty powders, and shows that such are detrimental to the teeth both to the enamel and cementum when these are brushed in the ordinary way. For patients who have healthy gums and teeth the following dentifrice is recommended: Magnesium peroxide, No. 200 powder, 6; sodium perborate, 3; powdered soap, 1; flavour, as desired. This is harmless to both enamel and cementum. Precipitated chalk, magnesia, siliceous earth, calcium phosphate were all experimented with and found to be harmful by direct experiment. All stains or decoloration of the teeth which cannot be removed by proper brushing with the magnesium peroxide powder should be treated by the dentist. Strontium and calcium peroxide have been recommended for use in dentifrices, but they are quite unsuitable for the purpose, being much too caustic.

A saturated aqueous solution of sodium silicofluoride, 0·61 per cent., forms an excellent antiseptic mouth wash. It may be held in the mouth for 2 to 5 minutes, 3 times a day; and is specially valuable for treating pyorrhoea and for healing inflamed guns.

Dentifrices. E. W. Lucas. (*Perfum. Record*, 1913, **4,** 150.) Tooth powders, tooth pastes and liquid mouth washes are treated of. Thirteen formulae for the former and 14 for liquid preparations are given, with practical instructions for compounding.

Digestive Candy. (*Amer. Drugg.*, 1912, **60,** 376.) Ginger, Jamaica, 2 oz.; rhubarb, 1 oz.; caraway seed, $\frac{1}{2}$ oz.; cardamom seed, $\frac{1}{2}$ oz.; sugar, 5 pounds; water, sufficient.

The spices should be in the finest possible powder and well mixed and cleaned by sifting. Melt the sugar with a little water and boil until the syrup begins to thicken, then sift in the spices and continue the cooking with constant stirring until a small portion of the candy removed and dropped into cold water hardens instantly. The mass is then poured into greased mould

and cut into squares of the desired size while still warm, set aside to harden and the squares finally dusted with powdered sugar or starch and put into boxes. The most difficult part of the operation is judging the final cooking point. The finished candy should be hard and brittle, yet readily dissolved in the mouth.

Dilute Organic Acids for Dentifrices. W. J. Gies. (*J. Allied. Dent. Socs.*, **7,** 397; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7,** 645.) The use of diluted vinegar, the acid juices of common fruits, and similar acid liquids is recommended to disintegrate and remove the deposits formed on teeth. Vegetable acids are harmful to most of the buccal bacteria. When used as dentifrices, they diminish tendencies to bacterial fixation, and hinder carbohydrate lodgment and fixation. The flow of saliva which they stimulate is also beneficial to the condition of the mouth and teeth. Alkaline dentifrices and mouth washes do not suffice for the prevention of dental caries.

Drying Oven, Solution for, Giving 102° to 105°C. E. Cordonnier. (*Bull. Sci. Pharm.*, 1912, **19,** 413.) The jacket of the oven should be filled with the following solution: Borax, 600 Gm.; water, 1,200 c.c.; glycerin, 600 c.c. The b.p. of this is 105°C. The oven should bear at the steam outlet an efficient reflux condenser, to prevent evaporation. This liquid will give a temperature of 102°–105°C. inside the oven. With an ordinary water jacket it never exceeds 98°C.

Egg Shampoo. (*Drugg. Circ.*, 1913, **57,** 344.) Egg yolk, 2 oz.; strong infusion of quillaia, 1 oz.; salicylic acid, 5 grains; camphor, 10 grains; borax, 30 grains; cologne water, 3 oz.; chloroform water, enough to make 20 oz.

Make a smooth mixture of the egg yolk and 2 oz. of chloroform water; add the infusion of quillaia and then the cologne water in which the salicylic acid and the camphor have been dissolved. Add the borax and the required amount of chloroform water, mix well, and strain through muslin.

Eggless Embrocation. (*Pharm. Zeit.*, 1913, **58,** 210.) Camphor, 30, is dissolved in oil of turpentine, 480; and sesame oil is added to the solution, soft soap, 60, is dissolved in solution of ammonia (sp. gr. 0·960), 150. The two solutions are thoroughly emulsified; then water, sufficient to produce a total weight of

1,500, is gradually added, with thorough shaking after each addition.

Electrical Accidents, First Aid in. R. Morton. (*Med. Review*, 1913, **16,** 138.) Death from electrical shock is at first only apparent. Whatever the conditions and severity of the accident, there is practically always time during which it is possible to resuscitate the victim by artificial respiration. It is the first duty of the bystander to do this. He must not leave the victim to summon medical aid which may be too late, but should send for it if there is any one to go. If the victim has fallen clear of the electrical contact first aid may be given at once; but if he is still in contact with the circuit, the first step is to get him clear. This is dangerous to the rescuer unless care is taken; but the necessary precautions are simple for any voltage likely to be encountered by the public. If the victim remains in contact with the circuit his body must not be touched by the rescuer, but the latter may pull him out of contact by hauling on the clothing. He should take off his own coat, insert his hands in the sleeves and so handle the victim. This may then be done with little or no risk, provided the clothing fabric is dry, and of moderate thickness. Artificial respiration should be proceeded with immediately the victim is freed, and persevered in for at least two hours, or until the patient revives. After return to consciousness complete rest is essential for a day or two. Under no circumstances must a man be allowed to resume work at once, as he may wish to do if the shock has been light. With prompt application of first aid, practically every victim can be completely revived.

Elixir Pectorale Anglicum. (*Pharm. Zentralh.*, 1913, **54,** 203.) Crushed squill, 100 Gm.; crushed orris root, 100 Gm.; crushed elecampane, 100 Gm.; benzoin, 8 Gm.; licorice root, 5 Gm.; anise fruit, 5 Gm.; myrrh, 5 Gm.; purified ammoniacum, 2·5 Gm.; saffron, 1 Gm.; alcohol, 30 per cent., 700 Gm. Macerate for 14 days, then filter.

Etching Liquid for Iron or Steel. (*Nat. Drugg.*, 1912, **42,** 472.) Copper sulphate, 48 parts; alum, 24 parts; sodium chloride, 3 parts; nitric acid, 2 parts; acetic acid, glacial, 24 parts; distilled water, 168 parts. Mix the water and acetic acid, and in the mixture dissolve the salts. Finally, add the nitric acid. If the liquid acts too energetically, add more water;

if too slowly, cautiously add more HNO_3. The surface to be etched must first be thoroughly cleansed from oil or grease, and must be bright. The surface is then covered with a thin layer of melted wax or lard and tallow (or soap). The letters to be etched are cut out in this with a sharp-pointed instrument. The etching fluid is carefully poured on, preferably from a pipette. When action has proceeded far enough the whole is washed off in running water.

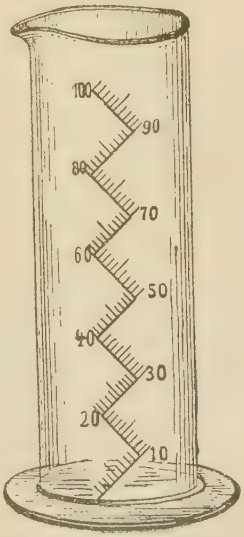
Face and Toilet Powders. H. Mann. (*Amer. Perfum.: Mid. Drugg.*, 1912, **46**, 517.) Zinc oxide is a valuable ingredient in face powders, on account of its great covering power. Powdered zinc stearate is also specially valuable since it imparts a pearly brilliance without being too evident. Its addition to grease powders is also useful on account of its covering power. As a general basis, a combination of zinc stearate, 25; magnesium carbonate, 40; and rice or maize starch, 35, is recommended. The stearate should be of good colour; if not pure, it is apt to be yellowish. Another good powder may be obtained by combining the stearate with the finest powdered French chalk. If a powder specially rich in fatty matter is desired, the solution of the oil or fat dissolved in petroleum benzin may be sprayed over it and then mixed, the solvent being afterwards evaporated off. Another method consists of rubbing down a small amount of odourless liquid paraffin with a portion of the powder; then mixing this with the bulk by repeated sifting. (See also *Y.B.*, **1912**, 369.)

Fats, Oils and Waxes, Decolourization of. (*La Nature: J. Pharm. Chim. Append.*, 1913, **7**, 42.) One of the simplest and at the same time most efficacious methods of decolourizing vegetable or mineral oils, fats or waxes, consists in treating them with diatomaceous earth. This acts through its extreme porosity. The minute apertures in the frustules of the diatoms enclose air in an extremely minute state of division. This acts as a decolourizer, and also modifies any marked odour. Mineral oils or waxes are heated to 100–150°C.; animal fats to about 80°C.; vegetable oils are treated at the ordinary temperature. From 2 to 5 per cent. of the diatomaceous earth is intimately mixed with the liquid fat and agitated for 30 minutes. The mixture is then allowed to stand until clear, when the supernatant oil is decanted. It is stated that animal and vegetable

fats which have been treated thus become rancid much less easily than those which have not been so refined.

Flies, Means of Destroying.—Vaillard. (*J. Pharm. Chim.*, 1913, **7,** 399.) Dilute formaldehyde solutions are excellent fly poisons. The following may be employed: Commercial formol solution, 15; milk, 25; water, 65. Mix and allow to stand about the infested apartments in shallow vessels. A little sugar may be added. In autumn, however, any such means will be less effective, as flies do not then feed freely. To drive away flies from an apartment, or to kill them or mosquitoes, when clustered on the walls or ceilings, cresol is very effective if volatilized, in the proportion of 5 Gm. for each cubic metre. In this quantity cresol thus used is quite harmless to human beings.

Glass, Thin, to Bore a Hole in. (*Amer. Drugg.*, 1913, **61,** 46.) When it is desired to bore a hole in thin glass, in order to avoid cracking, put a ring of moist clay around the spot, leaving vacant a spot in the centre of the exact size of the desired hole; then pour into the ring a spoonful of melted lead. This causes the glass in the vacant place to break and drop out, and the lead empties itself through the hole into the vessel placed below to catch it.



Graduation, New System for, for Volumetric Apparatus. Goebel. (*Apoth. Zeit.*, 1913, **28,** 51.) Instead of the familiar horizontal graduations on measures, burettes and other apparatus the author advocates the adoption of markings so arranged that the apex of an acute angle forms the point from which the reading of the meniscus can be taken. The series of graduations may be marked either along a diagonal, a spiral, or as in the figure reproduced, according to the form of apparatus to be graduated.

It is claimed that the readings are much more accurate than those obtained with the usual horizontal graduations.

Hair Dyes, Characterization of. — Cerbeland. (*Boll. Chim. Farm.*, **51**, 300; *Chem. Abstr. Amer. Chem. Soc.*, 1913, **7**, 207.) Hair dyes of commerce have as bases *p*-phenylenediamine, diaminophenol, pyrogallic acid, gallic acid, or henna. Henna extracts are rare, and some of them contain $CuSO_4$. To detect presence of bases, take 5 c.c., dilute if necessary, and add 5 drops Javelle water and 1 drop of HCl (1–10); the following colours develop: fugitive emerald-green with *p*-phenylenediamine; stable raspberry-red with diaminophenol; yellow-brown with pyrogallic acid; reddish black, then black, with gallic acid; practically no colour change with henna. If an excess of HCl is added to above tests, the following results are obtained: Colour disappears immediately with *p*-phenylenediamine; colour is accentuated, and becomes wine-red with diaminophenol; colour is weakened and becomes lemon-yellow with pyrogallic acid; disappears, and becomes amber-yellow with gallic acid; colour disappears and leaves uncoloured liquid with henna. If 5 c.c. of dye are treated with 0·20 Gm. $NaNO_2$ and then HCl, there appears: light yellow, decreasing with excess of HCl, with *p*-phenylenediamine; persistent brownish yellow with excess of HCl with diaminophenol; orange-yellow with pyrogallic acid; pale yellow with gallic acid; no appreciable colour change with henna. Fe_2Cl_6 gives olive-green with henna; with *p*-phenylenediamine occurs emerald-green, rapidly changing to violet and then to deep green. These reactions are common to many products and may cause confusion. *p*-Phenylenediamine may be detected by its action on milk containing H_2O_2, by development of azure colour. Dyes with bases of *p*-phenylenediamine are sold in connexion with bottles of H_2O_2. This may be detected by addition of a crystal of CrO_3 and Et_4O. On shaking, an azure colour develops in presence of H_2O_2.

Kummerfeld's Lotion or Cosmetic Water, Improved Formula for. O. Raubenheimer. (*Nat. Drugg.*, 1913, **43**, 97.) Camphor, 1; acacia, in fine powder, 2; glycerin, 5; precipitated sulphur, 10; rose-water, to make 100 Gm.

Triturate the finely powdered camphor with the acacia and the precipitated sulphur, then add the glycerin and gradually the rose-water, triturating constantly so as to obtain a homogeneous lotion. Shake well before dispensing.

Insecticides, Horticultural, Alkaline, to render evenly Distributable. V. Vermorel and E. Dantony. (*Comptes*

rend., 1913, **156,** 1475.) The authors have previously (*Y.B.*, **1912,** 359) shown that horticultural washes may be rendered easily distributable by the addition of 10 to 50 Gm. of gelatin per hectolitre. In the case of alkaline washes, however, some gelatins are not suitable. For bouillie bordelaise and similar preparations with an alkaline reaction, casein should be used in the proportion of 20 to 50 Gm. per hectolitre. The casein should be first dissolved in milk of lime and added to the mixed wash.

Liquid Ammonia as a Room Disinfectant. — Riegler. (*La Nature*, Feb., 1913; *J. Pharm. Chim. Supp.*, 1913, **7,** 22.) Stronger solution of ammonia, exposed in a shallow vessel in a perfectly closed room, is an efficient means of disinfecting the apartment. One kilo is enough for a room of 100 square metres. Fabric inoculated with cholera and typhoid bacilli were sterile in 2 hours; with anthrax bacilli and spores in 3 hours; and with diphtheria bacilli in 8 hours. The method is cheap, and it does not harm furniture, fabrics or colours.

Mastisol for Wounds. W. V. Oettingen. (*Pharm. Zeit.*, 1913, **58,** 199.) Gum mastic, 20 Gm.; chloroform, 50 Gm.; linseed oil, 20 drops. Dissolve.

Micro-Objects, New Method of Mounting. C. Cépède. (*Comptes rend.*, 1913, **156,** 683.) Instead of the usual plain glass slide, a slide of similar dimensions and material, but perforated in the centre with a circular aperture, is used, similar to the sunk cell at present employed but with the whole of the central portion cut out. The sides of the aperture are not vertical, but slightly inclined inwards, so as to form a flange in the centre of the thickness of the glass. A thin cover glass is laid on this, so as to form the bottom of the mount. The object is arranged on this cover, with a drop of balsam or gelatin medium. Another cover, of slightly larger dimensions, is laid on, and gentle pressure applied in the ordinary way. The superfluous medium, exuding round the edges of the two covers, is sufficient to form a seal when dry. By graduating the size of the upper cover glass, the depth of the mount may be modified as desired. With the lower cover fixed with a trace of balsam, the appliance forms a live box for aquatic objects, to which an upper cover of any desired size can be superimposed. The great advantage of this mount is that the object, being between two

thin cover glasses, can be examined on either side, top or bottom, with the highest close-working immersion lenses. Also, with the most of the media employed, ringing the cover to the slide is not necessary. Further, as the mount is below the plane of the slide, several mounted slides can be packed one on the other in a pile, thus obviating the necessity for special trays or carriers, which are necessary under the present methods of mounting. Except for very thick objects, the necessity for a built up cell is obviated. The method also permits of better illumination of the object than can be obtained on the thicker crown glass slide.

Microscopical Work, Critical Illumination in. D. J. Reid. (*Journ. Quekett Microscop. Club.*, 1912 [2], **11,** 487.) The following is a summary of the main points in a useful practical paper. The lamp, preferably a kerosene lamp, with a flat wick, trimmed to give a well shaped flame, is placed about a foot away and directly in front of the microscope, and raised so as to be a little higher than the mirror. (1) After roughly focussing, the edge of the flame is centred in the field by means of the mirror, and partly by moving either the lamp itself or the microscope laterally. (2) The sub-stage condenser is centred, by bringing the sub-stage iris into view and centering it with the sub-stage screws. (3) The sub-stage iris is then to be opened, and the image of the flame again focussed on the field and re-centred. (4) The collecting lens in front of the lamp is then adjusted so as to throw a nearly-sharp enlarged image of the flame on the surface of the mirror, keeping the lens rather within than without the focus. (5) The collecting lens iris is closed, and centred by moving the lens from side to side. When centred by moving the lens only, the iris may be opened. (6) If the field is not then illuminated fully, even to the extreme edge, the lamp is too far off and must be brought nearer until the whole field is illuminated. (7) The eyepiece should now be removed, and the back of the objective examined, the sub-stage iris being fully opened for the purpose. If it is crossed by a streak form of illumination, the lamp and collecting lens are too near. If illuminated by a circular image, but not quite to the edge, the N.A., of the condenser is too small for the objective. If very bright in the centre, fading away towards the edge, the condenser is not aplanatic or the condensing lens is not properly adjusted in relation to the lamp. Low powers, with an unusually large N.A., are the most difficult to illuminate. If the object is too

fully flooded with light, this must be cut down by the sub-stage iris. Suitable colour screens may be introduced, and if the object occupies only part of the centre of the field the rest may be darkened by partly closing the Nelson iris so as not to fatigue the eye with an unnecessarily large field. For oil immersion, objectives of high aperture, above 1·0 N.A., an immersion condenser with the N.A. 1·35 or 1·4 must be employed, and the lamp with collecting lens moved farther away from the microscope to 24 or 36 inches, or more. For medium powers, $\frac{1}{2}$ to $\frac{1}{4}$ inch, the dry condenser of 1·0 N.A. may be used, the lamp being brought nearer, 6 to 12 inches. For low powers, a low power condenser must be used, the front combination being removed from the condenser, and the lamp brought as near as 4 to 8 inches.

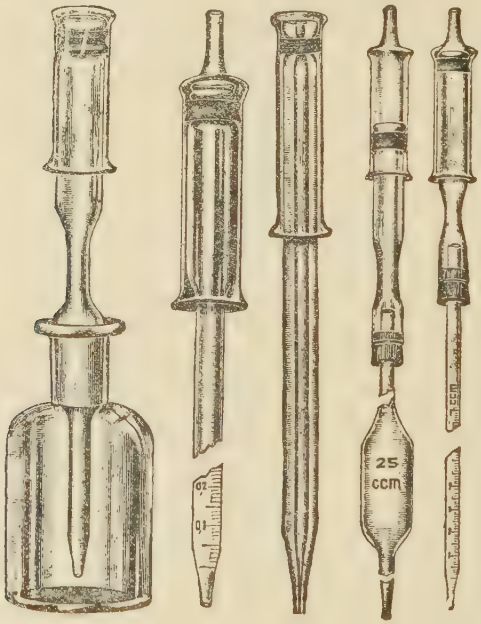
Mouth Wash, American. (*Nat. Drugg.*, 1913, **43,** 67.) Thymol, 0·3 Gm.; alcohol, 90 per cent., 160 c.c.; glycerin, 120 c.c.; Venice soap, 16 Gm.; carbolic acid, 10 drops; rose geranium oil, 15 drops; calamus oil, 10 drops; sassafras oil, 15 drops; eucalyptus oil, 6 drops; pine oil, 40 drops; distilled water, 700 c.c.

Mouth Washes. (*Nat. Drugg.*, 1913, **43,** 100.) *Neutral Mouth Wash.*—Vanillin, 0·25 Gm.; saccharin, 0·25 Gm.; salol, 9·5 Gm.; menthol, 15 Gm.; tincture of cochineal, 25 c.c.; spirit, 850 c.c.; perhydrol, 850 c.c. *Thymol Mouth Wash.*—Thymol, 0·5 Gm.; carbolic acid, 2 Gm.; borax, 5 Gm.; spirit of peppermint, 15 c.c.; rose-water, 200 c.c.; distilled water, 300 c.c. *Acid Mouth Wash.*—Lactic acid, 40 c.c.; cochineal, 1 Gm.; peppermint oil, 30 c.c.; clove oil, 3 c.c.; cinnamon oil, 6 c.c.; distilled water, 400 c.c.; alcohol, 1,600 c.c.

New Laid Eggs, Test for. (*Neuste Erfind. und Erfahr.: Apoth. Zeit.*, 1913, **28,** 167.) A solution of NaCl, 1, in water 8, is prepared. New laid eggs, one day old, at once sink to the bottom of this. Eggs two days old sink, but do not touch the bottom. Those three days old swim on the surface. The older they are the higher they float above the surface.

Onion Wine. P. Carles. (*J. de Méd. de Bordeaux: L'Union Pharm.*, 1912, **53,** 517.) Ripe raw onion, 2; clarified honey, 1; white wine, 7. This preparation retains the diuretic and antiseptic properties of onion, which are lost by cooking.

Pipettes, Self-filling. (*Pharm. Zentralh.*, 1913, **54,** 255.) The figures show an attachment which may be fitted to ordinary pipettes. It consists of a glass cylinder, with an aperture on top which is closed with the finger in the usual manner. The cylinder is fitted to a fixed piston; so that when the former is drawn up a vacuum is formed, and the liquid enters the pipette. The outflow is regulated in the customary manner with the index finger. This device should be useful for corrosive liquids,



such as Nessler's solution, and is indispensable for accurately measuring sterile liquids.

Pomades for Stimulating the Growth of the Hair. (*Nat. Drugg.*, 1913, **43,** 183.) (1) Carbolic acid, 5; sublimed sulphur, 25; ox or horse marrow, 250; oil of bergamot, 3. Mix. (2) Pilocarpine hydrochloride, 4; yellow vaselin, 40; lanolin, 160; lavender oil, 3. (3) Pilocarpine hydrochlorate, 2; quinine hydrochlorate, 4; precipitated sulphur, 10; balsam peru, 20; beef marrow, sufficient to make 100. Perfume to taste.

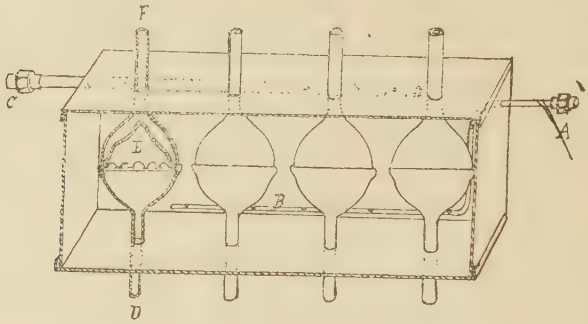
Powders, Simple Method of Determining the Density of. M. Billy. (*Comptes rend.*, 1913, **156,** 1065.) The difficulty of completely eliminating the error due to minute quantities of adherent air, when powders are immersed in water or other fluid in order to determine their density, is well known. The powder is first subjected to an atmosphere of CO_2 and then immersed and weighed in KOH solution of about normal strength. A specially devised picnometer, which is illustrated, may be used. It is stated that by this method the difference between the density of a substance in mass and in powder determined on the same balance is only 1 : 3,000, which is the limit of error of the balance itself. By the ordinary method of weighing the powder in water, the ratio of error was ten times greater, 1 : 300, with the same balance. This process obviates the error due to minute quantities of air adhering to the comminuted articles of the substance.

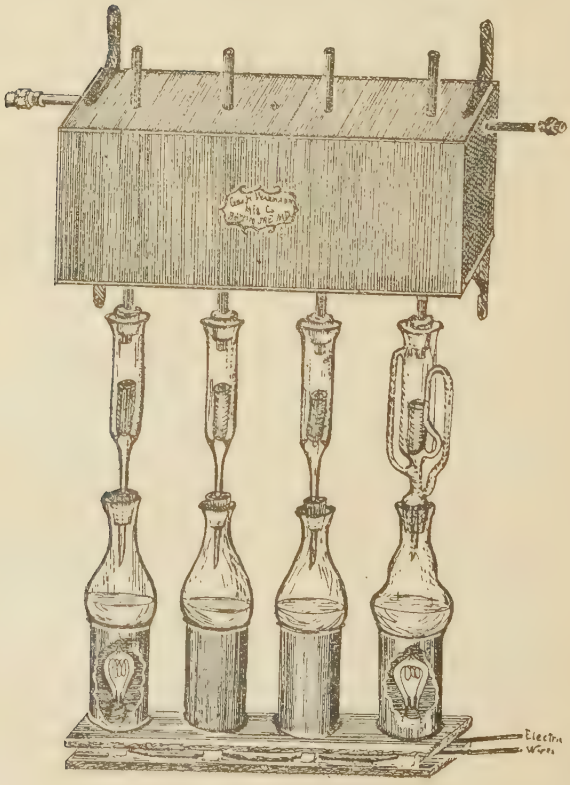
Razor Disinfectant. (*Annales d'Hygiène : J. Pharm. Chim. Append.*, 1913, **7,** 22.) Oil of winter green (or artificial methyl salicylate), 30 Gm. ; tincture of quillaia, 6 Gm. ; water, 6 litres. This is stated to be a powerful antiseptic, for barbers' use.

Reflux Condenser. S. W. Wiley. (*J. Indust. Eng. Chem.*, 1913, **5,** 151.) This condenser is efficient, and occupies a small space. The cuts show clearly the construction of the various parts and the large condensing surface that can be obtained in comparison with the size of the water jacket. The condensing tubes are of block-tin tubing and on entering the water jacket are connected to bell-shaped condensers of spun copper. On entering the bell, which is composed of two sections, the uncondensed ether or other vapour passes through perforations and is condensed on the upper surface. The condensing surface of this arrangement is over 120 square inches in comparison to the straight tube usually used, two feet being the length that is ordinarily used with an internal diameter of $\frac{3}{8}$ inch which would have a condensing surface of about 25 square inches. The water inlet is so arranged that the water bubbles up and surrounds every portion of the condenser. (See p. 384.)

Sea Foam Shampoo. (*Nat. Drugg.*, 1913, **53,** 21.) Potassium carbonate, 1 part ; castile soap, white, powdered, 16 parts ; tincture of quillaia, 2 parts ; water, 16 parts ; alcohol, sufficient

to make 32 parts; oil of bay, or other essential oil, sufficient to perfume. Mix.





(*See p.* 383.)

Skin Cream, Disappearing. (*Amer. Drugg.*, 1912, **60,** 529.) Agar-agar, 80 gr.; distilled water, 8 fl. oz.; rose water, 12 fl. oz.; stearic acid, 360 gr.; cacao butter, 360 gr.; monohydrated sodium carbonate, 240 gr.; distilled water, 12 fl. oz.

Break up the agar-agar into small pieces and macerate in the water at a gentle heat until it is softened, add the rose water, dissolve by gentle heat, and strain the thick mucilage through muslin. Heat the stearic acid, cacao butter, sodium carbonate and water together at a gentle heat until chemical action ceases and a clear transparent fluid results. Now add the first solution while this is still warm and beat briskly with an egg beater until cold. If the beating is done thoroughly a smooth, stiff cream will result, much of the success depending upon the beating. Any desired perfume may be added during this operation. Only the monohydrated carbonate of sodium should be used. (See also *Y.B.*, **1910,** 328.)

Skin Cream in Collapsible Tubes. (*Nat. Drugg.*, 1912, **42,** 429.) White vaseline, 6 oz.; white wax, 1 oz.; spermaceti, 5 drachms; bismuth subchloride, 6 drachms; otto of rose, 6 minims; oil of bitter almonds, 1 minim; rectified spirit, ½ oz.

Melt the vaseline, wax and spermaceti together, and while cooling incorporate the subchloride of bismuth. Dissolve the oils in the alcohol, and add to the fatty mixture, stirring all until uniform and cold. In cold weather the quantities of wax and spermaceti may be reduced.

Shaving Lotions. (*Nat. Drugg.*, 1913, **43,** 18.) (1) Bay rum, 48 oz.; glycerin, 8 oz.; extract of violet, ½ oz.; rose water, 8 oz. Mix and filter if necessary.

(2) Glycerin, 6 fl. oz.; quince seed, ½ drachm; alcohol 90 per cent., 5 fl. oz.; oil of rose, 16 minims; hot water, 21 fl. oz. Pour 8 fl. oz. of the water upon the quince seed, agitate well until a mucilage is formed and strain through muslin. Pour the remainder of the hot water into a bottle, add the oil of rose, and shake well. Finally, add the alcohol. If desired, the lotion may be tinted by the use of a little anilin.

(3) Menthol, 5 grains; powdered tragacanth, ½ drachm; rectified spirit, ½ oz.; glycerin, 2 drachms; water to 6 oz. Dissolve the menthol in the spirit and add the tragacanth contained in a dry bottle; add the water, shake; add the glycerin, again shake.

Stains on Hands from Photographic Developers, Acid Liquid for Removing. M. Frank. (*Schweiz. Woch. Chem. Pharm.*, 1913, **51,** 6.) HCl, 5 c.c.; $H_2C_2O_4$, 1 Gm.; H_3PO_4, 3 c.c.; water to 100 c.c. After rinsing in hot water the stains are rubbed with this acid liquid and again thoroughly washed.

Sulphur Cream, Jackson's. (*Indiana Med. J.: Nat. Drugg.*, 1913, **43,** 183.) This ointment is used with success for eczema seborrhoicum of the scalp. White wax, ʒiiiss; white vaseline, ℥iiss; rose water, ℥j; borax, gr. xv.; precipitated sulphur, ʒiiiss. This makes an elegant, nearly white mixture without sulphur odour. An amount the size of an acorn is rubbed into the scalp once or twice a week. It is useful for scurf and dandruff.

Surol Hair Tonic. E. Idmarm. (*Farm. Notisblad*, 1913 [6]; *Apoth. Zeit.*, 1913, **28,** 260.) Castor oil, 5 Gm.; tincture of cantharides, 30 drops; tincture of nux vomica, 30 drops; eau de cologne, q.s., to perfume; alcohol, 90 per cent., to make 100 Gm.

Toilet Creams. E. W. Lucas. (*Perfum. Record*, 1913, **4,** 64.) A practical article giving formulae and directions for the preparation of more than a dozen modern skin creams.

Toilet Creams. (*Amer. Drugg.*, 1913, **61,** 193.) *Witch Hazel Liquid Cream.*—Gum tragacanth, 2 oz.; boric acid, ½ oz.; extract of witch hazel, 32 fl. oz.; glycerin, 6 oz.; water, 16 fl. oz.; perfume, ½ fl. oz.

Macerate the tragacanth in the water for a day or two until soft, then add the extract of witch hazel and glycerin, in which the boric acid has been dissolved; heat at a moderate temperature until a clear translucent solution is obtained, and then strain through cloth to remove lumps. This might be called a basic formula; if a lotion is desired the amount of tragacanth should be decreased; if a jellylike preparation is wanted more tragacanth should be used. The proportions given will make a mixture of honey-like consistency. If a creamy preparation is desired this effect can be obtained by adding a drachm or two of tincture of benzoin or oil of sweet almonds and emulsifying it by vigorous shaking of the mixture in a large bottle. Such preparations may be perfumed by adding essential oils or perfume extracts, the latter being probably the most satisfactory. Half an oz.

of jockey club, rose, azura or other pronounced odours will be sufficient for the quantities given above.

Menthol Liquid Cream.—Menthol, ½ oz.; bay rum, 32 fl. oz; mucilage of linseed, 96 fl. oz.

The mucilage of linseed is made by simmering at a moderate heat 1 lb. of clean, whole linseed to 1 gallon of water until the mucilaginous matter is extracted, straining this through cloth and evaporating, if necessary, to make a product about the consistency of honey. The menthol is dissolved in the bay rum, adding a little alcohol if this is weak, this solution is added to the mucilage of linseed and the mixture shaken until a creamy emulsion results. As linseed varies considerably in mucilaginous matter a little experimenting may be necessary to get the right proportion. Quince seed can be used instead of linseed if preferred.

Iceland Moss Cream.—Boric acid, ½ oz.; iceland moss, 8 oz.; castile soap, ½ oz.; water, 128 fl. oz.; perfume, as desired.

The Iceland moss is first well washed with cold water and steeped with about a gallon of warm water for 24 hours; this mixture is then simmered at moderate heat until thick and gelatinous. Add water from time to time to replace that lost by evaporation. When the moss is thoroughly extracted strain the mucilage through cloth, adding sufficient hot water through the strainer to make about 96 fl. oz, then add the soap and boric acid, each dissolved in 16 fl. oz. of hot water, and shake the mixture vigorously until emulsified. Add perfume as desired.

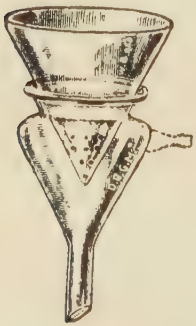
Hamamelis Skin Cream.—Stearic acid, 20 parts; sodium carbonate, dry, 3 parts; petrolatum, liquid white, 5 parts; extract of witch hazel, 100 parts; water to make 200 parts.

Melt the stearic acid and paraffin together and saponify with the sodium carbonate dissolved in water by aid of gentle heat. When saponification is completed and the solution still warm add the extract of witch hazel, previously warmed to about the same temperature, and stir or beat the mixture until cold.

Toothache Mixture. (*Pharmazeutische Post: Nat. Drugg.*, 1913, **43,** 183.) Phenol in loose crystals, 10; camphor, 8; menthol, 8. Triturate these three ingredients together in a mortar, and, when liquefied, add chloroform, 4; oil of cloves, 1; oil of mustard, volatile, 1. Moisten a small plug of cotton with the fluid and insert in the cavity of the tooth.

Tooth Pastes. (*National Drugg.*, 1913, **43,** 182.) *Harlan's Tooth Paste.*—Calcium carbonate, precipitated, 1,500 ; sodium fluorosilicate, 250 ; tannic acid, 80 ; sugar, 750 ; cuttle fish bone, 250 ; oil of wintergreen, 10 ; massing fluid, enough to make a paste. *Jenkin's Tooth Paste.*—Soap, 33 ; calcium carbonate, precipitated, 25 ; absolute alcohol, 20 ; glycerin, 15 ; benzoic acid, 3 ; oil of eucalyptus, 2 ; oil of peppermint, 2 ; saccharin, ½ ; thymol, ½. Make into a paste. *Salol Tooth Paste.*—Precipitated calcium carbonate, heavy, 350 ; powdered orris root, 150 ; sugar of milk, 100 ; powdered castile soap, 50 ; salol, 20 ; oil of peppermint, 5 ; oil of cloves, 3 ; massing fluid, enough to make a paste. The massing fluid referred to in the above formulas may be made according to one of the following recipes. (1) Gelatin, 1 ; glycerin, 30 ; water, 35. Soak the gelatin in water, apply gentle heat and add the glycerin. (2) Glycerin, 2 ; mucilage of acacia, 2.

Tooth Paste Flavours. (*Drugg. Circ.*, 1912, **57,** 75.) (1) Oil of spearmint, 50 ; oil of star anise, 30 ; oil of ceylon cinnamon, 2 ; oil of clove, 5 ; oil of bergamot, 2. (2) Oil of cloves, 55 ; oil of star anise, 47 ; oil of spearmint, 40 ; oil of citronella, 8. (3) Oil of spearmint, 4 ; oil of clove, 1 ; oil of Russian anise, 1 ; oil of Ceylon cinnamon, 1 ; oil of rose, 20 ; oil of orange, 2. (4) Oil of rose, 1 ; oil of angelica, 1 ; oil of orris, 3 ; tincture of vanilla, 10. (5) Oil of rose, 6 ; oil of neroli, 4 ; oil of citron, 2 ; oil of cinnamon, 2 ; oil of clove, 2 ; oil of lavender, 1 ; oil of pimento, 1. (6) Oil of rose, 1 ; oil of cinnamon, 2 ; oil of clove, 9 ; oil of lemon, 8 ; tincture of vanilla, 24.



Vacuum Filter, New Form of. (*Apoth. Zeit.*, 1913, **28,** 347.) The perforated funnel illustrated is very convenient for general employment, and allows the use of the familiar conical filter paper. The lower portion of the apparatus is made either with a side tubulure when it is desired to attach it directly to the pump, or without, when the funnel is to be used with a receiver already connected with the vacuum.

Varnish for Recent Wounds, Finck's "Hautlack."—Spindler. (*Petersburg Med. Stschr.*, 1912 [3]; *Schweiz.*

Woch. Chem. Pharm., 1913, **51,** 6.) Venice turpentine, 15; mastic, 12; dark rosin, 25; pale rosin, 8; alcohol, 90 per cent., 180 by weight. Dissolve and filter. This is applied directly to the wound, after drawing together the edges, and shaving the skin in the neighbourhood. A bandage is applied after half a minute.

Water Pump, New Form of. (*Pharm. Zeit.*, 1912, **57,** 946.) The glass water pump figured is claimed by Tolmacz to give a high vacuum with a comparatively low water pressure. It can be attached directly to an ordinary water tap. The efficacy of the pump is increased by attaching rubber tubing to the discharge tube and regulating the rate of the outflow by means of a pinch-cock.

X-Rays, Fabric Opaque to. — Droit. (*Comptes rend.*, 1912, **155,** 521.) The author impregnates silk material with lead phosphotungstate. Six layers of this is an excellent protective against X-ray dermatitis for those who have to perform X-ray work.

X-Ray Installation as an Adjunct to the Pharmacy. J. G. Everitt. (*Pharm. J.*, 1913 [4], **36,** 4.) In view of the extended use of X-rays, it is suggested that the installation of an efficient "plant" in the pharmacy may prove useful to medical practitioners who may desire to avail themselves of this means of diagnosis, or for the curative treatment of disease. Details for the fitting of such an installation, and its cost, are plainly set forth.

RESEARCH LIST, 1913

THE following subjects are suggested for investigation, and the Executive Committee hope that Members of the Conference will undertake to work on one or more of these questions. It will be noted that some of the subjects have already been appropriated. In order to avoid duplication the Honorary General Secretaries trust that members will communicate to them their intention of working at any of the subjects mentioned; they also wish to direct attention to the fact that a special fund exists to defray expenses connected with research work. The Executive Committee will be glad to receive applications from members for grants from this fund.

Apiol.—A standard formula for its preparation is required.

Atropine Sulphate.—Is the commercial article variable in character?

Belladonna Root.—In what respects, if any, does a tincture from the fresh root differ in its composition and action from one from the dried root.

Calx Sulphurata.—An examination of the processes of manufacture and the purity of commercial samples is needed. (Already undertaken.)

Cannabis Indica.—The physical characters and therapeutic values of the official preparations are stated to be liable to considerable variation. An investigation is required to determine whether any chemical standard is possible, and if not, whether physiological tests should be introduced. A report on the comparative values of the official Indian drug and those varieties produced in Goa, Africa, America, and Greece is desirable.

Casein (Soluble).—A process is required for the preparation of a soluble casein.

Cinnamic Aldehyde.—Is this compound extremely prone to oxidation, under conditions such as prevail during steam distillation, as has been suggested?

Drugs.—Cereus grandiflorus, Cassia fistula, Serenoa serrulata,

Arnica montana, *Monsonia ovata*, *Monsonia biflora*, *Thuja occidentalis*, *Tanacetum vulgare*, *Senecio Jacobea*, *Achillea millefolium*, *Aletris farinosa*, Cascara Sagrada, Senega, Senna (leaves and fruit) require further systematic investigation.

Ergot.—A re-investigation of the pharmacy of this drug in the light of recent chemical work is required, and a method of determining the activity of the galenical preparations.

Ferments.—The action of ferments in inducing change in galenical preparations should be studied.

Formulæ.—Improved formulæ are required for the administration of nauseous drugs, such as cascara, coca, male-fern, etc.

Glycerophosphates.—An examination of commercial specimens would be of interest.

Gum-Resins.—The value of the saponification numbers in determining the identity and purity of the resin of gum-resins.

Liquor Hamamelidis.—What is the nature of the aldehydic constituent in this preparation? (See 'Year Book,' 1911, page 195.)

Male Fern.—The chemistry and pharmacy of this drug both require investigation. (Already undertaken.)

Morphine.—Can the process described in the 'Year-Book of Pharmacy,' 1907, page 107, for the determination of morphine be applied to opium and its preparations?

Oil of Soya Bean.—Can this be utilised in pharmacy?

Opium, Extract of.—To what is the loss of morphine due in making this extract? Is it constant with different lots of opium?

Pareira (Bahia).—Examination of the alkaloidal constituents is required.

Phenol, Liquefied.—The pharmacy of this drug requires further investigation.

Pills.—A systematic examination is required of the times necessary for the solution or disintegration of pills prepared with different excipients and kept for various periods of time.

Powdered Drugs.—A systematic microscopical examination of powdered drugs is required.

Quillaia Bark.—Experiments to determine the best solvent for exhausting this bark for the purpose of making emulsifying agents, and a comparison of the genuine bark with the thin bark at present in commerce.

Santonin.—Analyses are required showing the percentage of this in Colonial and Indian species of *Artemisia* allied to *Artemisia maritima*.

Saponins.—A simple and accurate method of determining saponins in drugs is required.

Solvents.—Experiments are needed with a view to extending the use of solvents such as acetone, carbon tetrachloride, dichlorethylene, petroleum ether, amyl acetate, etc., in pharmacy.

Strophanthus.—An examination of the published methods of separating the different active principles obtained from the official seeds is needed with a view of recommending a standard process. The seeds in commerce are frequently mixed. Further information is required as to the active principles they severally contain.

Tannin.—A ready and tolerably accurate method for the determination of the tannin in various astringent drugs is required. (Already undertaken.)

Taraxacum Root.—The investigation of fresh drugs such as this by Bourquelot's method for the detection and isolation of easily hydrolysed glucosides is required.

Thyroideum Siccum.—Further examination of commercial samples is required.

Tinctures (Concentrated and Non-Alcoholic).—The best methods of preparation and the examination of commercial samples are required.

Uric Acid.—A comparison of the processes for the estimation of uric acid would be useful.

Valerian Root.—Chemical investigation of the fresh root by Bourquelot's method is required.

THE TRANSACTIONS

OF THE

British Pharmaceutical Conference

AT THE

JUBILEE MEETING

HELD IN LONDON,

JULY 21–24, 1913.

British Pharmaceutical Conference.

JUBILEE MEETING IN LONDON, July 21–24, 1913.

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Programme of Conference Sessions

HELD IN

The Throne Room, Holborn Restaurant,

TUESDAY, JULY 22, 1913.

Order of Business.

10 a.m. Opening of CONFERENCE. Address of Welcome by Mr. EDMUND WHITE, B.Sc., F.I.C., *President of the Pharmaceutical Society of Great Britain and Chairman of the Local Committee.*

Welcome to the Delegates from the Continent and British Overseas, Dominions and Home Associations.

Presidential Address by Mr. JOHN C. UMNEY, F.C.S.

Report of Executive Committee. Financial Statement.

11.30 a.m. SCIENCE SECTION. (FIRST SESSION.)

1. *The Standardization of Opium for Pharmaceutical Purposes—"Normal Opium,"* by Prof. P. VAN DER WIELEN.
2. *The Myrrh of Commerce, Ancient and Modern,* by E. M. HOLMES, F.L.S., F.E.S.
3. *Chemical Examination of Wheat Germ,* by Dr. F. B. POWER and Dr. A. H. SALWAY.
4. *The Structure of the Soya Bean,* by T. E. WALLIS, B.Sc., F.I.C.
5. *Factors Relating to the Pharmacy of Thyroid Glands,* by R. GLODE GUYER.
6. *Further Report on the Iodine Content of Thyroid Gland,* by N. H. MARTIN, F.C.S.

2.30 p.m. PRACTICE SECTION.

Chairman, W. S. GLYN-JONES, M.P. Discussion on :—

The Operation of the Food and Drugs Acts.

(*a*) *The Legal Point of View,* by H. WIPPELL GADD, Barrister-at-Law.

(*b*) *The Wholesale Druggist's Point of View,* by C. A. HILL, B.Sc., F.I.C.

(*c*) *The Practising Pharmacist's Point of View,* by J. P. GILMOUR.

(*d*) *The Public Analyst's Point of View,* by EDWARD HINKS, B.Sc., F.I.C.

WEDNESDAY, JULY 23, 1913.

10 a.m. SCIENCE SECTION. (SECOND SESSION.)

7. *Extract of Male Fern: Analytical Notes,* by C. A. HILL, B.Sc., F.I.C.
8. *The Analytical Constants of Extract of Male Fern,* by E. F. HARRISON, B.Sc., F.I.C., and P. A. W. SELF, B.Sc., F.I.C.

9. *An Examination of the Essential Oil of Witch Hazel*, by H. A. D. JOWETT, D.Sc., and F. L. PYMAN, Ph.D., D.Sc.
10. *Ergot and its Preparations, a Critical Review of the Requirements of the British Pharmacopœia*, by FRANCIS H. CARR, F.I.C., and H. H. DALE, M.D.
11. *The Determination of the Hypophosphites with Notes on Commercial Samples*, by T. TUSTING COCKING, and J. D. KETTLE, B.Sc., F.I.C.
12. *Powdered Rhubarb*, by E. T. BREWIS, F.I.C., and HAROLD DEANE, B.Sc., F.I.C.
13. *The Alleged Poisonous Properties of the Honey of Datura Stramonium*, by HAROLD DEANE, B.Sc., F.I.C.
14. *Tablet Making for the Retailer*, by P. G. CHAMBERLAIN, M.A.
15. *The Composition of Certain Formates*, by C. H. HAMPSHIRE, B.Sc., A.I.C., and W. R. PRATT, B.Sc., A.I.C.
16. *Note on Sodium Thiosulphate Solution*, by C. H. HAMPSHIRE, B.Sc., A.I.C., and W. R. PRATT, B.Sc., A.I.C.
17. *The Proportion and Composition of Alcohols in Geranium Oils*, by W. H. SIMMONS, B.Sc.
18. *Mercuric Oxide as a Standard in Volumetric Analysis*, by Prof. L. ROSENTHALER and A. ABELMANN.
19. *The Reichert and Polenske Values of Various Fresh and Rancid Oils*, by G. D. ELSDON, B.Sc., A.I.C., and HERBERT HAWLEY, M.Sc., A.I.C.

2.30 p.m. CLOSING PROCEEDINGS.

1. Presentation to Mr. E. Saville Peck, M.A., Past Senior Honorary General Secretary.
2. Election of Officers for 1913–1914.
3. Invitation to Chester.
4. Vote of Thanks to the Local Committee and to the Ladies' Committee.
5. Vote of Thanks to the Pharmaceutical Society of Great Britain and its Officers.
6. Vote of Thanks to the President of the British Pharmaceutical Conference.

LIST OF VISITORS, LONDON, 1913.

Aberdeen—Giles, W.
Adelaide—Clayton, J. W., and Mrs. Clayton.
Amsterdam—Suyver, Dr. J. F.; van der Wielen, Prof. P.
Bedlington—Foggan, G., and Mrs. Foggan.
Belfast—Nicholl, J. W.; Nicholl, T.
Benalla, Victoria—Say, Victor.
Bickley—Layman, E. B.; Layman, Miss F.
Birkenhead—Hughes, Miss D. C.; Richards, J. H., and Mrs. Richards.
Birmingham—Buckingham, H; Hollick, R., and Mrs. Hollick; Mann, E. W., and Mrs. Mann; Ottey, T.; Poole, J., and Mrs. Poole; Smith, F., and Mrs. Smith.
Bolton—Knott, H.
Bootle—Wyatt, H.
Bournemouth—Bilson, F. E., and Mrs. Bilson; Conder, Mrs. E. A.; Harrie, H. W.
Bradford—Hanson, A.
Brighouse—Naylor, F.
Bury—Crompton, H.
Buxton—Wright, R.
Cambridge—Campkin, Alderman A. S.; Church, E. H.; Evans, J.; Flanders, H., and Mrs. Flanders; Flanders, Miss; Mallett, T. J.; Peck, E. S.
Carluke—Hinksman, John, and Hinksman, Jack F.
Cheltenham—Thomas, J. A., and Mrs. Thomas.
Chester—Shepheard, W. F. J.
Colchester—Smith, J. Beddall.
Coleraine—Baxter, Sir William, and Lady Baxter.
Cork—Mayne, A., and Mrs. Mayne.
Cosham—Baker, C. H.
Cults—Reith, J. Reid.
Dartford—Brown, J.; Jackson, R. E.; Jowett, Dr. H. A. D., and Mrs. Jowett.
Derby—Elmitt, W., and Mrs. Elmitt.
Ditton Hill—Stevenson, H. E.
Doncaster—Sheard, Miss E. I.; Stiles, M. H.
Donegal—Chapman, R. S., and Mrs. Chapman.
Dover—Cuff, J. H.
Dowlais—Rees, R. P.
Dublin—Grimes, H. C., and Mrs. Grimes; McWalter, Dr. J. C., Wells, W. F.; Wells, Miss A. M.
Durban—Cooper, J. W.
Edinburgh—Bannerman, R. J., and Mrs. Bannerman; Bayne, T.; Blenkiron, T., and Mrs. Blenkiron; Coats, J. T., and Mrs. Coats; Dey, A. J.; Duncan, W., and Mrs. Duncan; Duncan, Miss D.; Glass, W. S., and Mrs. Glass; Glass, Miss, and Miss Mary Glass; Hendry, R. L., and Mrs. Hendry; Mackenzie, J.; Mair, W.; Mitchell, J. B., and Mrs. Mitchell; Richardson, W. J.; Stephenson, T.; Tait, J.
Enfield—Fletcher, F. W.
Exeter—Gadd, H. W., and Mrs. Gadd; Rowsell, P. F.; Wallis, T. E.
Fareham—Batchly, Mrs.
Farnworth—Watkinson, H. A.

Forfar—Macfarlane, M.

Glasgow—Crombie, J., and Mrs. Crombie; Forrester, Mrs. W.; Foster, J.; Foster, Miss; Gilmour, J. P., and Mrs. Gilmour.

Godalming—Mather, J. H.

Gosport—Smith, E. H.

Haddington—Williamson, Stewart; Wilson, W. P.

Hamilton—Reekie, Balfour.

Haslemere—Blaker, Mrs.; Skinner, Miss.

Hepscott—Simpson, T., and Mrs. Simpson; Simpson, T. M.

High Wycombe—Spencer, Miss K.

Hitchin—Ransom, F.

Hong-Kong—Koch, Dr., and Mrs. Koch.

Hove—Cripps, R. A.

Huddersfield—Walshaw, R. C., and Mrs. Walshaw.

Ilkley—Worfolk, G. W.

Inverness—Mitchell, D.

Ipswich—Sayer, E. C., and Mrs. Sayer.

Kenley—Lawrence, H., and Mrs. Lawrence.

Kingston-on-Thames—Higgs, A., and Mrs. Higgs.

Lancaster—Arkle, W., and Mrs. Arkle; Arkle, Miss; Cockroft, G. L., and Mrs. Cockroft.

Leeds—Beacock, J. H.; Branson, F. W., and Mrs. Branson; Smith, A. R.

Leicester—Cholerton, A. F.; Cholerton, Miss G.; de St. Dalmas, W. H. E.

Leith—Coats, J. T. and Mrs. Coats.

Liverpool—Abraham, T. F., and Mrs. Abraham; Abraham, Miss; Evans, Sir Edward; Jones, H. H., and Mrs. Jones; King, Miss K. M.; Last, G. V. C., and Mrs. Last; Marsden, P. H., and Mrs. Marsden; Saunders, W. H., and Mrs. Saunders; Symes, Dr. C.

London—Allen, C. T.; Allen, Kenneth C., and Mrs. Allen; Andrews, Mrs. C. E. J.; Arnold, H. R.; Arrowsmith, A. R., and Mrs. Arrowsmith; Ashton, F. W., and Mrs. Ashton; Atkins, E. A.; Atkins, Mrs. B.; Atkinson, A. P., and Mrs. Atkinson; Aukland, W. H.; Aukland, Miss; Baker, H. W.; Bartlett, Miss D. J.; Bascombe, F., and Mrs. Bascombe; Batchelor, Mrs.; Bennett, R. R., and Mrs. Bennett; Benson, R. H.; Beverley, W. T.; Bird, F. C. J.; Bird, Miss; Boehm, F.; Bolderson, Miss; Bonner, C. G.; Bourdas, Miss A.; Bourdas, Dr. E. C., and Mrs. Bourdas; Bourdas, I.; Bowie, G. Duncan; Braithwaite, Miss D.; Braithwaite, J. O., and Mrs. Braithwaite; Brammall, R. T., and Mrs. Brammall; Brammall, Miss; Bremridge, R.; Brewis, E. T.; Britton, A.; Brooks, C.; Brown, G.; Browne, W., and Mrs. Browne; Buchanan, Miss M. E.; Burgum, Miss; Carr, F. H.; Carter, J. C., and Mrs. Carter; Chater, A. J.; Claremont, Miss H. E.; Cohn, Miss Dorothy; Craig, Miss J.; Crawshaw, E.; Crossley, Prof. A. W.; Crossley-Holland, F. W., and Mrs. Crossley-Holland; Dale, Dr. H. H.; Douglas, J. W.; Evans, J. E.; Finnemore, H., and Mrs. Finnemore; Francis, Alan, and Mrs. Francis; Francis, E. W.; Francis, Miss; Francis, G. B., and Mrs. Francis; Francis, W. H., and Mrs. Francis; Freke, Mrs.; Freke, Miss; Gamble, F. W., and Mrs. Gamble; Gibson, Miss A. M.; Gibson, G. W.; Glyn-Jones, W. S., and Mrs. Glyn-Jones; Goldthorpe, A.; Goodall, F. C., and Mrs. Goodall; Goodall, Mrs. H. E.; Goodall, T. S., and Mrs. Goodall; Goodyer, N. S.; Gray, Miss G.; Greenhill, F.; Greenish, Prof. H. G., and Mrs. Greenish; Gulliver, W. F., and Mrs. Gulliver; Gunn, A.; Hampshire, C. H.; Harries, M., and Mrs. Harries; Harrington, J. F., and Mrs. Harrington; Harrington, Miss A.; Harrison, E. F., and Mrs. Harrison; Hatfield, G. W.; Hennings, Dr. C. R.; Hewitt, T. L.; Hewlett, V. C.; Heywood, Miss S. J.; Hill, C. A.; Hills, J. S.; Hinks, E.; Hocking, F. A.; Hoffman,

C. M.; Holmes, E. M.; Holstein, Miss; Howard, D. Lloyd; Howell, A.; Howie, W. L., and Mrs. Howie; Humphrey, B.; Humphrey, J., and Mrs. Humphrey; Humphrey, Miss; Humphrey, Miss O.; Humphrey, W.; Idris, W. T., and Mrs. Idris; Idris, T. H. W., and Mrs. Idris; Jacks, D. R.; James, J.; Jenkin, A. H., and Mrs. Jenkin; Jennings, J. A.; Jones, A., and Mrs. Jones; Keall, J., and Mrs. Keall; Keith, A. R., and Mrs. Keith; Lescher, T. E., and Mrs. Lescher; Lindsay, R. W.; Linstead, E. F.; Lloyd, I. T.; Lownsborough, R. E.; Lucas, E. W.; Lucas, H.; Maben, T.; Macdonald, A.; MacEwan, P., and Mrs. MacEwan; MacEwan, Miss; Mackenzie, D., and Mrs. Mackenzie; Mackenzie, Miss; Marshall, J. D., and Mrs. Marshall; Martin, H.; Masson, H.; Matthews, J. H. and Mrs. Matthews; Melhuish, A. R., and Mrs. Melhuish; Miller, D. E.; Miller, Miss G.; Miller, W. E.; Mills, H. A.; Milner, J., and Mrs. Milner; Mitchell, H., and Mrs. Mitchell; Morson, T. P.; Mumford, H. G.; Naylor, W. A. H.; Nelson, W. B., and Mrs. Nelson; Newbery, F.; Pearson, G.; Pearson, G. E.; Philp, W. J. I., and Mrs. Philp, Pinchin, W. J., and Mrs. Pinchin; Potter, W., and Mrs. Potter; Power, Dr. F. B.; Pratt, W. R.; Presant, C. S., and Mrs. Presant; Price, H. H. G., and Mrs. Price; Procter, H. Raithby, and Mrs. Procter; Procter, Miss; Quarrell, W. H.; Renouf, Miss Nora; Roberts, W.; Robinson, R. A., jun., and Mrs. Robinson; Rogers, F. A.; Royle, J. W.; Sanger, E., and Mrs. Sanger; Sayers, W. C., and Mrs. Sayers; Self, P. A. W.; Shaw, Mrs.; Shears, J. C.; Shewell, A. B.; Shirtliffe, W. E. D., and Mrs. Shirtliffe; Simmons, W. H.; Skinner, Herbert, and Mrs. Skinner; Smith, B., and Mrs. Smith; Smith, Johnston; Solomon, A. H.; Stamp, F. U., and Mrs. Stamp; Stephens, H. I.; Stevenson, H. E.; Storey, W. A.; Storey, Miss; Tawell, T. E.; Thomas, J. O.; Thomas, Miss; Tocher, G. A., and Mrs. Tocher; Tyrer, T.; Udale, G. W.; Umney, Miss B.; Umney, Charles; Umney, E. A.; Umney, J. C., and Mrs. Umney; Umney, J. H.; Umney, Mrs. W. F.; Want, W. P., and Mrs. Want; Wardle, Miss Elsie; Warner, C. H.; Warrick, R. W.; Watson-Will, Mrs.; Webb, H.; Wellcome, H. S.; Weston, S. G.; Whatmough, W. A.; Whigham, R. L., and Mrs. Whigham; White, E., and Mrs. White; White, J.; Widdowson, T. S., and Mrs. Widdowson; Wilkinson, Miss D.; Wilkinson, W., and Mrs. Wilkinson; Williams, T. R., and Mrs. Williams; Wing, A. J.; Woolcock, W. J. U., and Mrs. Woolcock; Woolley, S. W.; Wright, A.; Wright, H.

Long Melford—Allen, G. Stafford; Deane, Harold, and Mrs. Deane.

Manchester—Balmforth, A.; Bates, F. W., and Mrs. Bates; Blyton, J. H.; Cleworth, J.; Franklin, J. H.; Grier, J., and Mrs. Grier; Haworth, J. B.; Hope, J., and Mrs. Hope; Kemp, H.; Kemp, Miss; Pidd, A. J.; Pidd, Miss M. E.; Wyatt, W., and Mrs. Wyatt.

Melbourne—Francis, R. P., and Mrs. Francis.

Mitcham—Betts, F. C.

New Barnet—Rose, Mrs.; Young, R. F.

New South Wales—Potter, A. Lush.

Newcastle-on-Tyne—Clague, T. M., and Mrs. Clague; Heselton, C. J., and Mrs. Heselton; Martin, N. H.; Martin, Miss; Park, J., and Mrs. Park; Pescod, W.; Pescod, Miss; Simpson, T., and Mrs. Simpson; Simpson, T. Munro.

Nottingham—Middleton, A. and Mrs. Middleton.

Oakengates—Dunn, W. R. and Mrs. Dunn.

Oxford—Clayton, C.; Dolbear, J.; Druce, G. Claridge; Loxley, F. L. K.; Willson, A. Rivers.

Paisley—Fraser, A.

Paris—Fourneau, M.; Jarvis, Dr. J. and Mrs. Jarvis.

Perth—Forbes, J. J., and Mrs. Forbes; Forbes, Master W.; Humber, Miss.

Plymouth—Turney, J. Davy; Woods, W. H., and Mrs. Woods.
Portobello—Nesbit, James.
Princetown—Bullen, F. E.
Richmond—Parrott, J.
Rotterdam—van Gorcum, W. C.
Ryde—Pollard, E. W.
Salisbury—Atkins, S. R.
Sevenoaks—Parsons, Miss D. M.
Sheffield—Antcliffe, H., and Mrs. Antcliffe.
Shrewsbury—Cross, W. G., and Mrs. Cross; Cross, Miss.
Sittingbourne—Eacott, R. G.
Southampton—Bates, W., and Mrs. Bates; Bates, Mrs. Harry; Wride, F. B.
Southsea—Barlow, T. O., and Mrs. Barlow; Bell, W. A.; Stevenson, W.
Staines—Sharvill, F., and Mrs. Sharvill.
Sunningdale—Gilling, C.
Swansea—Havard, H. L., and Mrs. Havard.
Twickenham—Price, R. T. A.
Uckfield—Farr, E. H.
Uppingham—Bayley, C., and Mrs. Bayley.
Weybridge—Neathercoat, E. T.
Wolverhampton—Phillips, H. A.; Phillips, S., and Mrs. Phillips.
Worcester—Steward, Ald. J. A.

THE CONFERENCE SESSIONS

ORDER OF BUSINESS.

Tuesday, July 22, 1913.

The Conference Sessions opened at 10 a.m. in the Throne Room of the Holborn Restaurant. Mr. John C. Umney, President, took the Chair, and was supported on the platform by Messrs. S. R. Atkins, Chas. Umney, N. H. Martin, E. M. Holmes, G. Claridge Druce, T. H. W. Idris, W. A. H. Naylor, Thomas Tyrer, F. Ransom, W. F. Wells and Sir Edward Evans (Past Presidents of the Conference), and by Mr. Edmund White (President of the Pharmaceutical Society and Chairman of the Local Committee), Mr. J. P. Gilmour (Chairman of the North British Branch of the Pharmaceutical Society), Sir William Baxter (President of the Pharmaceutical Society of Ireland), Mr. D. Lloyd Howard (Treasurer), and Messrs. H. Finnemore and R. R. Bennett (Hon. General Secretaries). There were also on the platform Professor P. van der Wielen (University of Amsterdam), Mr. W. C. van Gorcum and Dr. J. F. Suyver (Pharmaceutical Society of the Netherlands).

Local Committee's Welcome.

Mr. Edmund White, B.Sc., F.I.C., said that it was his very pleasant duty on behalf of the Local Committee to give the British Pharmaceutical Conference a very hearty welcome to London. He said it was only thirteen years since the Conference met in London before, and he believed that many present would have very pleasant recollections of the last occasion. Now they had not only another visit from the Conference, but it was celebrating its Jubilee in London. The Local Committee had borne this in mind and they were going to do their very best to make the visit worthy of the occasion.

The President tendered sincere thanks on behalf of the delegates and others attending the Conference for the Local Committee's kind reception. He said that last night at the Guildhall they had had an earnest of what the Local Committee could do, and it seemed that every visitor might look forward to a very enjoyable programme during the week

Letters of Congratulation and Apology for Absence.

Mr. H. Finnemore read a number of letters and telegrams of good wishes and congratulations that had been received from persons who were unable to attend the meetings of the Conference. The list included messages from Mr. R. T. Baker, Sydney, New South Wales; Professor M. T. Bogert, President of the American Section of the Society of Chemical Industry; Mr. G. A. Champion, Ex-President of the Natal Pharmaceutical Society; Mr. W. B. Day, President of the American Pharmaceutical Association; Professor Froelich, Berlin; Dr. J. J. Hofman, General Secretary of the International Pharmaceutical Congress, The Hague; Professor L. Van Itallie, University of Leyden; Mr. J. H. H. Jury, President of the Canadian Pharmaceutical Association; Professor Kiliani, University of Freiburg; Mr. G. J. Mackay, President of the Pharmaceutical Society of Queensland; Mr. J. H. Maiden, Director of the Botanic Gardens, Sydney, N.S.W.; Professor J. Moeller, University of Vienna; Professor J. P. Remington, Chairman of the Committee of Revision of the Pharmacopœia of the United States of America; Professor L. Rosenthaler, University of Strassburg; Professor H. Thoms, President of the German Pharmaceutical Society; Mr. F. A. Upsher Smith, Editor of the "North-Western Druggist," U.S.A.; Professor E. Tilg, Berlin; Professor A. Tschirch, University of Berne; Mr. A. Wadsworth, President of the Pharmacy Board of New South Wales; Mr. H. W. Wiley, President of the United States Pharmacopœial Convention; Professor A. G. Perkin, University of Leeds; and Messrs. F. H. Alcock, C. B. Allen, R. S. Bliss, H. Garnett, R. Glode Guyer, Walter Hills, C. A. Johnstone, Edmund Jones, G. Lunan, J. A. Radford, W. Ransom, C. I. Russell, and J. F. Tocher.

Reception of Delegates and Visitors from the Continent and British Overseas Dominions.

Mr. H. Finnemore read the names of the following delegates and visitors: Mons. Fourneau, Chef de Service à l'Institut Pasteur, Paris, representing the Pharmaceutical Society of Paris; Professor P. van der Wielen from the University of Amsterdam; Mr. W. C. van Gorcum, Treasurer, and Dr. J. F. Suyver, Secretary of the Pharmaceutical Society of the Netherlands; Mr. J. W. Cooper of Durban, Natal; Mr. Victor Say of Benalla, Victoria; Mr. and Mrs. R. P. Francis of Mel-

bourne ; Mr. and Mrs. J. W. Clayton of South Australia ; and Dr. and Mrs. Koch of Hong-Kong.

The PRESIDENT said it was his pleasure to give a very hearty welcome to the delegates and visitors from abroad. Although the welcome was a formal one it was very sincere indeed, and he was sure that every one would join him in extending every possible hospitality to the visitors whose names they had heard.

Sir WILLIAM BAXTER said that he brought from the Pharmaceutical Society of Ireland, which he had the honour to represent, their warmest greetings and congratulations to all present. He felt that it was a memorable occasion and he was happy to be able to present these greetings personally.

Dr. J. F. SUYVER expressed the happiness he felt in being present. He brought to the Conference cordial greetings and congratulations from the members of the Pharmaceutical Society of the Netherlands.

Professor P. VAN DER WIELEN also assured the members of the Conference of the delight he felt in being present. Later he would have the opportunity of addressing them upon a scientific subject.

DELEGATES FROM HOME ASSOCIATIONS.

Mr. H. FINNEMORE then read the names of the following delegates :—

Aberdeen Pharmaceutical Association.—Messrs. W. Giles, J. F. Tocher, D.Sc., F.I.C., J. R. Reith.

Association of Women Pharmacists.—Mrs. Freke, Misses Bedell, Bolton, Buchanan, Claremont, King and Wardle.

Bolton Pharmacists' Association.—Messrs. H. Knott and H. A. Watkinson.

Bradford and District Pharmacists' Association.—Mr. A. Hanson.

Cambridge and District Pharmacists' Association.—Messrs. E. H. Church, J. Evans, H. Flanders, T. J. Mallett, E. Saville Peck, M.A.

Cheltenham, Gloucester and District Pharmacists' Association.—Mr. J. A. Thomas.

Chester Pharmaceutical Association.—Mr. W. F. J. Shepheard.

Chemists' Assistants' Association.—Messrs. G. A. Tocher, R. W. Warrick, F.I.C.

County of Essex Association of Pharmacists.—Mr. J. H. Matthews.

County of London Association of Pharmacists.—Messrs. J. A. Thompson, G. A. Tocher.

County of Middlesex Association of Pharmacists.—Messrs. J. Humphrey, H. Skinner, R. L. Whigham.

County of Surrey Association of Pharmacists.—Messrs. F. Harvey, A. Higgs.

Dewsbury and District Pharmaceutical Association.—Mr. R. Gledhill.

Doncaster Chemists' Association.—Mr. M. H. Stiles.

Dover Chemists' Association.—Messrs. J. H. Cuff, R. M. Ewell.

East London Pharmacists' Association.—Messrs. G. Hatfield, A. R. Keith.

Edinburgh Chemists' Assistants and Apprentices Association.—Messrs. W. B. Cowie, W. Duncan, J. Tait.

Edinburgh District Chemists' Trade Association.—Messrs. J. Blenkiron, W. S. Glass, R. L. Hendry, J. B. Mitchell.

Hants. County Pharmaceutical Association.—Messrs. C. Baker, F. E. Bilson.

Huddersfield and District Chemists' Association.—Mr. R. C. Walshaw.

Leicester and Leicestershire Chemists' Association.—Messrs. S. F. Burford, L. Ough.

Liverpool Chemists' Association.—Messrs. H. H. Jones, W. F. Laycock, G. V. C. Last, P. H. Marsden, C. Symes, Ph.D., H. Wyatt.

Manchester Pharmaceutical Association.—Messrs. F. W. Bates, J. Cleworth, J. Grier, M.Sc., J. Hope, H. Kemp, A. J. Pidd.

Mid-Lanark Pharmaceutical Association.—Messrs. J. Hinksman, B. Reekie.

Midland Pharmaceutical Association. Messrs. H. Buckingham, E. W. Mann, J. Poole, F. Smith.

Newcastle Pharmaceutical Association.—Messrs. T. M. Clague, G. Foggan, W. Pescod, T. Simpson.

North London Pharmacists' Association.—Messrs. W. H. Aukland, C. A. Hill, B.Sc., F.I.C., P. MacEwan, H. Skinner.

North Staffordshire Chemists' Association.—Messrs. T. C. Cornwell, Edmund Jones.

Nottingham and Notts. Pharmaceutical Association.—Messrs. W. Gill, A. Middleton.

Oxford and District Pharmaceutical Association.—Messrs. C. Clayton, J. Dolbear.

Pharmaceutical Society of Great Britain.—Messrs. Edmund

White, B.Sc., F.I.C., A. S. Campkin, W. H. Gibson, C. B. Allen, F. E. Bilson, W. G. Cross, F. J. Gibson, R. L. Gifford, A. Hagon, J. F. Harrington, J. Harrison, E. T. Neathercoat, F. A. Rogers, F. P. Sargeant, W. J. U. Woolcock.

Pharmaceutical Society of Great Britain (*North British Branch*). —Messrs. W. Giles, W. S. Glass, J. P. Gilmour, J. Nesbit, T. Wilson.

Pharmaceutical Society of Ireland.—Sir William Baxter, D.L., Messrs. W. J. Hardy, L. Murray, I. W. Nicholl, D. M. Watson, W. F. Wells.

Plymouth and District Association of Pharmacists.—Mr. J. Davey Turney, Mr. H. Woods.

Portsmouth and District Pharmacists' Association.—Messrs. T. O. Barlow, W. A. Bell, T. A. White.

Public Pharmacists' Association.—Mr. F. E. Bullen.

School of Pharmacy Past Students' Association.—Messrs. W. H. Allen, A. Francis, C. H. Hampshire, B.Sc., A.I.C., V. C. Hewlett, H. Martin, W. B. Nelson, W. R. Pratt, B.Sc., A.I.C.

Sheffield Pharmaceutical and Chemical Society.—Mr. H. Antcliffe.

Shropshire Pharmacists' Association.—Messrs. W. G. Cross, W. R. Dunn.

Southampton Pharmaceutical Association.—Mr. W. B. Wride.

South Eastern of London Pharmacists' Association.—Messrs. A. Goldthorpe, H. A. Mills, W. C. Sayers.

West Aberdeenshire Pharmacists' Association.—Mr. J. R. Reith.

Wharfedale Pharmacists' Association.—Mr. G. W. Worfolk.

Wolverhampton and District Chemists' Association.—Messrs. W. R. Dunn, F. J. Gibson, S. Phillips.

THE PRESIDENTIAL ADDRESS.

By John C. Umney, F.C.S.

I am sensible that a very high honour has been conferred upon me in your inviting me to preside over this, the Jubilee Meeting of the British Pharmaceutical Conference, and I tender my sincere thanks to you for this mark of your confidence. I feel a double responsibility, firstly in that at this very important meeting I have the privilege of taking the place which has been occupied by the distinguished men who have preceded me in this Chair, and secondly, that I am the first "hereditary" President of the Conference, my father having in 1889 and 1890 presided at the meetings in Newcastle and Leeds. It might have been fitting that on this, the Fiftieth Annual Meeting of the Conference, the President should review the work of the Conference since its inception, but I put that subject on one side because an adequate historical review would encroach unduly upon the time of this meeting and try your patience utterly. Moreover, I believe the time is opportune to consider a subject which is of paramount importance to pharmacy. I refer to the revision and publication of the *British Pharmacopœia*.

The conditions of pharmacy and medicine have changed much since the Medical Acts of 1858 and 1862 brought the *British Pharmacopœia* into being and entrusted its publication to the General Medical Council. The character of the pharmacist's calling has been affected greatly by legislation and judicial decisions, upon some of which I shall speak later. It will be conceded that the position of the pharmacist to-day, whatever his sphere of activity may be, is higher than it has ever been, and that of necessity he is a man of considerable training and scientific attainment. When I say that the moment is opportune for consideration of the statutory provisions respecting the *British Pharmacopœia*, and how these should be modernized in consonance with progress in medicine, pharmacy and science during the lifetime of this Conference, I have in mind a special reason of the very highest importance, viz: the State recognition of the pharmacist as the dispenser of medicines. In my opinion this recognition is

a solid foundation upon which can be built up all the arguments for the pharmacist-dispenser getting a State-granted share with the medical prescriber in the preparation and publication of the *British Pharmacopœia*, which as the preface states (page 8) is intended as a guide to the members of the medical profession and those engaged in the preparation of medicines.

In order that we may understand clearly the claims of the two branches of the healing art, and make workable suggestions for future practice, let us consider the subject in the following divisions :—

(1) Past and present positions of the medical practitioner and the pharmacist.
(2) Positions of the General Medical Council, and the medical profession, and of the Pharmaceutical Societies and pharmaceutical calling as regards Pharmacopœia revision and publication.
(3) A survey of the methods of revision and publication of the Pharmacopœias of the world.
(4) Suggestions for future revision and publication of an Imperial British Pharmacopœia.

Before proceeding to the consideration of these various points in detail, I desire to make one pronouncement, which I do with a full sense of the responsibility that it entails. It is this : that the *British Pharmacopœia* of 1914 (for presumably it will be so dated) is almost ready for publication, and in connection with the revision of that work, the Committee of Reference in Pharmacy nominated by the Councils of the Pharmaceutical Societies of Great Britain and Ireland, has done its work to the best of its ability, and in all loyalty to the General Medical Council, but I am confident that it is the last occasion upon which pharmacists will aid in the revision of the *British Pharmacopœia* on the conditions which now obtain. There must be no misapprehension on this point in the minds of the General Medical Council or the medical profession generally, for besides the State recognition of pharmacists as dispensers of medicine that I have mentioned as a special reason, since the Statutory conditions for Pharmacopœia publication were formulated pharmacists have been by education and registration (on conditions formulated in later Statutes) established in the domain of physic as the legally qualified compounders of medicine. The time has arrived, in short, when the conditions favour readjustment of functions, medical and pharmaceutical, and I argue that this should be done with amity on both sides.

The Physician, Apothecary, and Dispenser

When the late Professor Theophilus Redwood, the first Pharmaceutical Editor of the *British Pharmacopœia* (1867), presided at our meeting in 1877, he described the evolution of the apothecary as the coadjutor of the physician and surgeon, and the gradual change of the apothecary in the course of a century and a half into a medical practitioner, so that the pharmaceutical part of his calling was neglected, and it was taken up by chemists and druggists.

It was in the year 1694 that the apothecaries, whose numbers had risen to about a thousand, had become an influential body, and by practising medicine as well as pharmacy had excited the jealousy of the physicians, who suffered from this encroachment, and endeavoured to reduce their rivals to their original position of vendors of drugs.

The contest was an acrimonious one, and pamphlets were published on either side; the apothecaries asserting that the assistants employed at the dispensaries of the physicians were unqualified and the drugs of poor quality, whereas the apothecaries' training, which consisted of eight years' apprenticeship, knowledge of drugs and plants, frequent use of them in shops, visiting markets and physic gardens, etc., gave them an experience and instruction which made them eminently fitted for their calling.

It is not easy to arrive at the truth of the many exaggerations which were put forward in this controversy, but it is evident that the dispensaries of the physicians were very popular, and that these assistants, employed and instructed by the physicians, became dispensing chemists on their own account, and that some of the apothecaries followed the example, from which is dated the origin of the chemist and druggist.

In the year 1723 the College of Physicians was empowered by Act of Parliament to visit and examine the shops of apothecaries, and many stories are recorded of the particularly dictatorial, offensive, and extremely unfair way in which such supervision was carried out.

The Corporation of Apothecaries obtained a Charter in the year 1748, or at any rate increased power was conferred upon them, probably by an Act of Parliament, empowering them to license apothecaries to sell medicines in London or within seven miles.

In a pamphlet entitled "The Apothecaries Mirror," published

in 1719, arguments were brought forward to show that the apothecary ought not to practise medicine, it being stated that the business of an apothecary is to compound certain drugs according to physicians' or surgeons' prescriptions; the statement being also made that the compounding of drugs prescribed, and knowing why they are prescribed, are two different things; and that further the natural history of the human body and acquaintance with the mechanisms and operations of nature are heights of knowledge at which few apothecaries arrive.

The first Association of Druggists appears to have been the General Pharmaceutical Association of Great Britain, which first met at the Buffalo Tavern, Bloomsbury Square, in the year 1794, and from the petitions presented by a Committee of that body to the College of Physicians, the Corporation of Surgeons, and the Society of Apothecaries in 1795, it is evident that the first organized attempt was made to enter upon the position which the chemists and druggists of to-day occupy, namely, as dispensers of medicines. In 1802 the apothecaries and chemists were brought together and induced to join hands for the purpose of protecting their mutual interests against the operations of the Medicine Act passed on the third of June of that year.

Many controversies continued between the College of Physicians and the apothecaries and the chemists and druggists, and suggestions were made that an examination Board composed of physicians, apothecaries and chemists should be formed, who would see that adequate education and examination of chemists and druggists should be carried out. It was not until 1841, however, that, probably on the suggestion of Mr. Bell, attempts were made to form a definite society to safeguard the permanent interests of chemists and druggists.

We may usefully summarize this brief historical survey of the status of the physician, apothecary and pharmacist, by a reference to a General Meeting of the Pharmaceutical Society in May, 1883, when Mr. R. W. Giles stated that pharmacists, or apothecaries as they were then, were in 1809 appointed members of a Joint Committee with Fellows of the College of Physicians for the compilation of the Pharmacopœia. At that time chemists and druggists were not organized, and so were unable to claim to be consulted in the matter of the Pharmacopœia; even when the Pharmaceutical Society was instituted, in 1841, and incorporated in 1843, no claim was put forward for participation in Pharmacopœia

work. Even when the Medical Act of 1858 was passed and the preparation of a Pharmacopœia was transferred from the Colleges of Physicians of the three countries to the General Council of Medical Registration and Education, the Society had not reached a stage at which it could represent itself as representative of compounders of medicines in the three countries. Since 1868 and 1875, however, the position is entirely altered, for the Pharmaceutical Societies of Great Britain and Ireland have by prescribed and regulated education, statutory examinations, and encouragement of research, made immense strides in the science and practice of pharmacy. It needs no better proof of the necessity of the help of the pharmacist in the compilation of the *British Pharmacopœia* than the request of the General Medical Council for co-operation which was made in connection with the 1890 Addendum to the edition of 1885, and in the preparation of the edition of 1898.

History of Pharmacopœia Revision and Publication

The first London Pharmacopœia was published by the College of Physicians in 1618, this being the first step towards producing a regular standard for the guidance of dispensers of medicine. It was doubtless an imperfect production, and subsequent editions were published by the College in 1621, 1632, 1639, 1650, 1677, 1721, 1746, 1788, 1809, 1815, 1824, and 1836. The Pharmacopœia of 1809 was prepared by a Committee of the Fellows of the College of Physicians in conjunction with a Committee of the Apothecaries Company, in whose laboratories the necessary experiments were made.

The first Edinburgh Pharmacopœia was published in 1699, and subsequent editions in 1722, 1736, and 1744. Eleven editions were also published from 1756 to 1841, the Pharmacopœia being in Latin until 1839.

The first Dublin Pharmacopœia was published in 1794, and another in 1805. These were described as "specimen Pharmacopœias," the first edition printed for actual use being in 1807. The third edition of the Dublin Pharmacopœia appeared in 1851, the intermediate one having been published in 1826, and therefore having had a very long life.

It was really Peter Squire who pointed out at one of the Meetings of the Pharmaceutical Society the necessity for the formation of a National Pharmacopœia, directing attention to the desirability

of having one Pharmacopœia for Great Britain and Ireland, in place of the three separate Pharmacopœias hitherto issued by the Colleges independently.

The Medical Act of 1858 was the means of bringing about important changes in the medical profession, and at least one important change in relation to pharmacy. The duty was assigned to the General Council of Medical Education and Registration of causing to be published under their direction a book containing a list of Medicines and Compounds and the manner of preparing them, and the amending Act of 1862 provided that the *British Pharmacopœia* should supersede the Pharmacopœias of London, Edinburgh, and Dublin. The London College had been making preparations for a new edition of the Pharmacopœia, and had arranged for the assistance of the Pharmaceutical Society.

At the first meeting of the General Council held in the Hall of the Royal College of Physicians, London, in 1858, a Committee was appointed to prepare and publish a national Pharmacopœia, which Committee requested the co-operation of the three Colleges of Physicians in the work. That Committee also was instructed to communicate with the Pharmaceutical Society for co-operation, and, another important point, the sum of £500, taken from the registration fees of existing medical practitioners, was voted by the General Council to defray the cost of preparing the Pharmacopœia for printing.

The records of the proceedings of the Pharmaceutical Society of that time show that the President, Mr. Jacob Bell, was particularly solicitous for the credit of his brethren, especially because he found that practically three or four members only of the London Committee which had been appointed contributed anything to the work of Pharmacopœia revision.

In the early part of 1864 the first *British Pharmacopœia* was published, and attracted a great deal of attention. It was evident however that the three previously existing Pharmacopœias had their representatives, and being located in London, Edinburgh, and Dublin, were too far removed to admit of concerted working, so that the Pharmacopœia produced bore evidence of many compromises, which were decidedly unfavourable to the work as a whole. The Medical Council were aware of the failure of their first attempt to produce a Pharmacopœia, and decided to bring out a new edition at as early a date as possible.

The preface of the Pharmacopœia of 1864 begins by stating that of the several functions conferred upon the General Medical

Council by the Medical Act of 1858, not one *had caused the Council more anxiety* than the preparation of the *British Pharmacopœia*. It is true this anxiety is stated to have been based upon the difficulty in superseding three Pharmacopœias by one, each of them long held in great repute, to reconcile varying usages in pharmacy and prescriptions of the peoples of three countries, hitherto in these respects separate and independent. The preface concludes with these words :—

"The Council warn all apothecaries and pharmaceutical chemists that on the publication of the *British Pharmacopœia* it will be necessary in order to discharge safely their duties to the public that they should duly alter or destroy all pharmaceutical preparations made according to previous and now altered formulæ."

Then to their own body they say :—

"The Council must further caution all medical practitioners, whether at home or in the Colonies or in the Public Services, that in order to exercise their profession safely it is encumbent on them to make themselves familiar with the changes effected by the present work."

The Pharmacopœia of 1867 was edited by Professor Redwood of the Pharmaceutical Society, and Mr. Robert Warington of Apothecaries Hall, under the direction of a Committee of the Council, Dr. Quain acting as Honorary Secretary, he being one of the nominees of the Privy Council on the General Medical Council. "Additions" to the Pharmacopœia of 1867, was published in 1874, in April of that year. Following the reading of a paper by my father, Charles Umney, on the "Additions," the *British Medical Journal* made the following important comment :—

"Many of the objections urged by Mr. Umney seem to indicate the necessity of giving greater prominence to the element of practical pharmacy in the Pharmacopœia Committee of the Medical Council. This has long been done in other countries, and the adoption of such a course would certainly be advantageous here ; for, though it is true that the decision as to the medicines to be comprised in the Pharmacopœia must always remain with those who have to prescribe their use, still, questions as to the best means of preparing them for various purposes call greatly for the aid of the practical pharmacist, who being daily occupied in such work, is enabled to bring to bear the results of his experience, so as to advantageously promote the objects of the physician. If this were properly done, we should then, perhaps, hear less of

complaints that officinal formulæ were inferior to other methods of preparation. The material services which Professor Redwood has already rendered in this direction may, perhaps, not without advantage, be supplemented by the aid of other pharmacists."

The first definite proposal that the Pharmaceutical Society or Pharmacists should be associated with the General Medical Council in the publication of the *British Pharmacopœia* was moved by Mr. Robert Hampson at the Meeting of the Council of the Pharmaceutical Society in July, 1874, in the following terms :—

"That this Council respectfully urges upon the General Medical Council the desirability of having appointed a Joint Pharmacopœia Committee of Physicians and Pharmacists, for the purpose of preparing any future edition of the *British Pharmacopœia*, or preparing any further Addendum to the present issue.

"This Council also suggests that it would be an equitable and desirable arrangement if the Council of the Pharmaceutical Society were to nominate the Pharmaceutists on the proposed Joint Pharmacopœia Committee."

In strong support of that suggestion, Mr. Thomas Greenish spoke, referring to the constitution of the Pharmacopœia Commissions or Committees of other countries. Anyone who reads the discussion which followed will see, however, that a weak-kneed policy was adopted with regard to Mr. Hampson's proposal, and several of the speakers appeared to think that the medical profession would be offended by any deliberate claim to participation in the production of a Pharmacopœia. So the Motion was modified on the suggestion of Mr. Sandford to read in less dictatorial fashion, as follows :—

"That this Council respectfully urges upon the General Medical Council the desirability of associating more practical pharmacists with any Committee which may be appointed for the purpose of preparing any future edition of the *British Pharmacopœia*, or any further Addendum to the present issue. This Council would be prepared to nominate such pharmacists in the event of the Medical Council agreeing to their proposal."

At the Fifth International Pharmaceutical Congress, held in London in August 1881, Michael Carteighe presented a paper on Pharmacopœia Revision, in which he stated that the necessity for the association of representatives of pharmacy with the medical profession in the compilation of a Pharmacopœia is a proposition

self-evidently reasonable to those members who had come to that meeting from abroad. He said :—

"It would seem a natural arrangement that while the representatives of medicine decide what drugs and remedies are to be inserted in the volume, the formulæ of the preparations best adapted to their administration would be most conveniently determined by practical pharmacists."

One of the points strongly urged by Mr. Carteighe, and one to which at the present time we strongly adhere, is that the information contained in each edition of the *Pharmacopœia* should be of comparatively recent date, because the authorities entrusted with the administration of the Sale of Food & Drugs Acts regard the *British Pharmacopœia* as the standard for preparations used in medicine which are mentioned therein. A subsequent resolution passed at the end of the Congress reads as follows :—

"That in the opinion of the Fifth International Congress meeting in London, it is the duty of all pharmacists to urge that in future revision of the National Pharmacopœia it is necessary that there should be a permanent Committee or Commission, comprising amongst its members the largest possible number of pharmacists. It should be the duty of this Commission during the periods between the publication of the successive editions to investigate such new drugs as make their appearance in the drug market, in order to determine the characteristics of their genuineness, and at the same time to submit the formulæ given in the *Pharmacopœia* to a continuous examination. The results of this work should be brought to the knowledge of those interested in an appropriate manner by publication before the final promulgation of that work."

The observations made at that Congress by the pharmaceutical representatives of other countries showed that whilst there are many points of difference in the methods of revision of the different countries, they have one feature in common, which is the provision that whilst medical men are present to decide as to the introduction of new or the rejection of obsolete remedies, the practical skill of pharmacists is utilized working out on the best methods of preparation.

In the year 1883 we come to the most interesting portion of the history of Pharmacopœia revision and publication. In April 1883 Mr. Hampson moved at the Council Meeting of the Pharmaceutical Society :—

"That inasmuch as the Medical Acts Amendment Bill, introduced into the House of Lords, contains no provision by which pharmacists shall be empowered conjointly with members of the Medical Council to revise and prepare future editions of the *British Pharmacopœia*, the Library and Museum Committee be authorized to take immediate steps with a view to remedy this omission."

In the speech which he made in support of this, Mr. Hampson referred to the fact that on the Continent of Europe pharmacy, as a distinct branch of medicine, had received the sanction of the State for many years, and it was not to be expected that they in England should at once receive the reward which the education and improved culture of pharmacists entitled them to. It seemed to him that the Council was bound in self-respect to make this request, for unless it did so pharmacists would probably have to wait twenty years before they could do so with any effect. Not twenty but thirty years have gone, and we still wait.

Speeches in support of this resolution were made by Dr. Symes, our President in 1897 and 1898. He urged that the compounding and preparation of medicines is essentially the function of the pharmacists, who were educated for that purpose. Mr. Schacht also put forward a suggestion which he had previously made to the effect that there should be representation of the Pharmaceutical Society upon the Medical Council.

Although it was recognized that the association of Professor Redwood in the compilation of the *Pharmacopœia* of 1867 was essentially a recognition of pharmacy and the Pharmaceutical Society, that was not in itself sufficient, in that the Society should be represented by its own active and working members.

As a result of this resolution and the opinions which had been so unanimously voiced, Mr. Michael Carteighe, President of the Pharmaceutical Society at that time, wrote a letter to the Privy Council, the exact terms of which I quote :—

"PHARMACEUTICAL SOCIETY OF GREAT BRITAIN,
"17 BLOOMSBURY SQUARE, W.C.
"*12th April*, 1883.

"C. LENNOX PEEL, ESQ., C.B.

"DEAR SIR,—

"I am requested by the Council of this Society to call the attention of the Lord President of the Council to the provisions of the "Medical Acts Amendment Bill" in so far as they relate to the preparation and revision of the *British Pharmacopœia*.

"This volume is to be produced under the direction of the Medical Council, but there is no instruction as to what class of persons is to constitute the Committee which must necessarily be appointed for compiling and revising the *Pharmacopœia previous* to its publication.

"In this country, hitherto, that Committee has consisted solely of members of the medical profession, whereas in all other European countries the constitution of that Committee is fixed by law, and it includes, in every case, a considerable number of pharmaceutical chemists, and in the United States of America, pharmacists form a majority of the Committee of Revision.

"The decision as to what drugs or medicines shall be introduced into or expunged from the *Pharmacopœia* rests with the medical members of the Committee, and the working out of the chemistry and pharmacy of the preparations and the manner in which they should be made rests with the pharmaceutical members.

"The Council of this Society considers that this or some other method should be followed in this country and laid down in the Bill now in the House of Lords. It is supported in this view by many members of the medical profession and by articles which have appeared from time to time in the medical press. Moreover, inasmuch as by the Pharmacy Act, 1868, and the Sale of Food and Drugs Acts, the *Pharmacopœia* is taken as the standard of purity and strength of such drugs and medicines as are contained therein, it seems desirable that the practical experience of pharmaceutical chemists should be made available on the Committee.

"I am desired by the Council to solicit the favour of a personal interview with the Lord President before the Bill is considered in Committee, to enable me to explain more fully its views and point out other considerations bearing on the subject.

"I am, dear Sir,

"Yours faithfully,

"(Signed) M. CARTEIGHE, President."

In addition to that memorial, one was addressed to the General Medical Council by the President and Council of the Pharmaceutical Society of Ireland, which pleaded that "in any Body appointed to this purpose" (namely the periodic revision of the *British Pharmacopœia*) "due representation should be accorded to pharmacists, as having special qualifications for aiding in an undertaking of such importance to the country."

A further memorial, in addition to the letter written by Mr. Carteighe, was addressed to the Privy Council by the Pharma-

ceutical Society of Great Britain in May, 1883, in which the relative positions of medicine and pharmacy were most clearly set out, and comparisons made with the methods of revision in other countries, including the United States of America. Not only was reference made to the methods of compilation desirable for the perfecting of the *Pharmacopœia* as a guide to prescriber and dispenser, but allusion was made in the following pointed words to the use of the *Pharmacopœia* as a standard under the Sale of Food and Drugs Acts and the Pharmacy Acts :—

"Moreover, inasmuch as by the Pharmacy Act of 1868 and the Sale of Food and Drugs Act, the *Pharmacopœia* is taken as the standard of purity and strength of such drugs and medicines as are contained therein, it seems desirable and equitable in the public interest that the practical experience of pharmaceutical chemists should be made available on the said Committee. . . . Since the value of the *Pharmacopœia* as a legal standard depends very much on the loyalty with which pharmaceutical chemists and druggists conform to its instructions, it seems politic to associate Members of the Pharmaceutical Body with the representatives of the Medical Profession on the Committee."

The Council of the Pharmaceutical Society suggested that the following clause should be inserted in the Medical Acts Amendment Bill, then under consideration :—

"For the purpose of compiling the said *Pharmacopœia* there shall be established a Pharmacopœia Committee consisting of six medical practitioners, to be nominated by the Medical Council, and five pharmaceutical chemists, four to be nominated by the Council of the Pharmaceutical Society of Great Britain, one of the four to be resident in Scotland, and one by the Council of the Pharmaceutical Society of Ireland."

Whilst these negotiations with the Privy Council were in progress, a bomb was thrown into pharmaceutical circles by the announcement of the General Medical Council that the three Professors of the Pharmaceutical Society, Redwood, Bentley, and Attfield, had been appointed editors of a new Pharmacopœia. I need only mention the very bitter controversy which followed a step that seemed to be the undermining of the position of the practising pharmacist by the Society's professional staff. The three professors, in a letter printed in *The Pharmaceutical Journal* of May, 1883 sought to justify the position which

had been conferred upon them, but looking back over the period of thirty years, one can see most clearly that had the professors not taken up the position which was offered to them the full and equal recognition of the practising pharmacist in *Pharmacopœia* revision would probably have been established long ere this. The pharmaceutical sentiment of that day and of this was expressed by the *Pharmaceutical Journal* of June 28, 1884, when it stated that :—

"Under the fostering influence of the Pharmaceutical Society the followers of pharmacy have gradually assumed a more worthy position in this country ; it has been increasingly felt that the time was at hand when they might reasonably ask for a recognized position in the Committee charged with the revision of future editions of the text-book, by the terms of which they are bound much more stringently than are medical practitioners."

The Attfield Period

The paper read by the late Professor Attfield before an Evening Meeting of the Pharmaceutical Society on February 14, 1894, will probably be still fresh in the minds of some of those who listened to it. In that paper Professor Attfield stated, in his private capacity, the aims and objects of the Imperial British Pharmacopœia, and referred, amongst other points, to the satisfaction that should be felt by pharmacists in the course that was then being adopted in connection with *Pharmacopœia* revision. It will be remembered that Professor Attfield had prepared for the General Medical Council a report on the revision of the *British Pharmacopœia*, in which he had referred especially to the official recognition of pharmaceutical research, and this official recognition rested upon a series of reports on the progress of pharmacy in its relation to the future revision of the *Pharmacopœia* of 1885, which he prepared and presented to the Pharmacopœia Committee of the General Medical Council, beginning with the year 1886. He stated that in this way encouragement was given to pharmacists to continue to make original pharmaceutical investigation, and that since the pharmacists of the Kingdom were organized into a public body by the foundation of the Pharmaceutical Society of Great Britain, those members of the craft, whether pupils, assistants, or principals, who possessed the necessary powers of accurate observation, reflection and description, had in fact printed the results of much investigation, ranging from the

humblest note to the most advanced research, the outcome of personal cost and effort. The Professor subsequently added that in his opinion, as regards pharmacy, the *Pharmacopœia* of 1885 was the pharmacist's own *Pharmacopœia*, and, referring to the galenical formulæ, he stated that they were largely constructed by pharmacists, who had supplied the chief pharmaceutical materials for the edifice, their own pharmaceutical experts being employed to put those other materials together. He went on, "but the full and free recognition of pharmaceutical research by the Medical Council is still more obvious in the 1890 Addendum to the *Pharmacopœia*," apparently because on page 7 of the Addendum there appear not only the names of the Pharmacopœia Committee of the General Medical Council, but also those of the Pharmaceutical Pharmacopœia Committee, to be taken as evidence before all the world, not only of the Union of Medicine with Pharmacy, but of the liberal recognition of that Union by the Medical Council. Whether these statements, made, as they doubtless were, in all good faith, were really believed by the General Medical Council, one cannot say. There can be no question, however, that they did not represent the opinion of pharmacists in general.

It may be remembered that towards the end of 1889 Dr. Quain, acting on behalf of the General Medical Council, addressed a letter to the Pharmaceutical Society asking for co-operation of pharmacists in connection with the publishing of an Addendum to the *Pharmacopœia* of 1885. As a result of that request a Committee was nominated, its appointment being referred to in the Preface of the work in the following terms :—

"The Council has also had valuable assistance in the preparation of the work from a Committee of the Pharmaceutical Society of Great Britain, consisting of :—

Mr. M. Carteighe, Pres., Chairman

The Vice-President	Mr. H. G. Greenish
Inglis Clark, D.Sc.	Mr. N. H. Martin
Mr. Ekin	Mr. Martindale
Mr. Gale	Mr. C. Umney

Each of the Committees has had the advantage of the service of the Annual Reporter on the *British Pharmacopœia* to the Medical Council, who also has edited these forty-four Additions to that volume."

Assistance on the same lines was rendered to the General

Medical Council by a Committee of the Pharmaceutical Society for the Pharmacopœia of 1898, the Committee consisting of the following members :—

Mr. Walter Hills, President	Mr. John Harrison
Mr. Newsholme, Vice-President	Mr. Joseph Ince
Mr. M. Carteighe	Mr. N. H. Martin
Inglis Clark, D.Sc.	Mr. W. Martindale
Mr. W. Gowen Cross	Mr. Charles Umney
Mr. Charles Ekin	Mr. H. G. Greenish, Secretary

In addition to the assistance of that Committee, the General Medical Council acknowledges that it has made constant use of important practical researches which have been carried out by British Pharmacists.

The Committee of Reference in Pharmacy

In June, 1904, the Chairman of the Pharmacopœia Committee of the General Medical Council wrote to the President of the Pharmaceutical Society of Great Britain, inviting the Council in co-operation with the Council of the Pharmaceutical Society of Ireland "to assist us"—(that is to say the General Medical Council)—"by nominating expert pharmacists to constitute a proposed Committee of Reference in Pharmacy," and in December, 1904, the President of the Pharmaceutical Society of Great Britain reported that the Committee of Selection of Nominees had reported and recommended those who have formed that Committee, similar nominations being made by the Pharmaceutical Society of Ireland.

A preliminary meeting of the Committee of Reference in Pharmacy with the Pharmacopœia Committee of the General Medical Council was held in February, 1905. From that time, this Committee of Reference has been engaged upon revision of nearly all the monographs of the *British Pharmacopœia*.

The Later History of Pharmacopœia Revision

would not be complete without a reference to the resignation of the Chairman of our Reception Committee, now President of the Pharmaceutical Society, Mr. Edmund White, from the Committee of Reference, which took place in 1911, and upon which he made a full statement to the Pharmaceutical Council. Al-

though in that statement he gave as the immediate cause the publication of the *Blue Book on the Practice of Medicine* by unqualified persons, those of us who know him well know that that was only the last straw which made Mr. White put forward his resignation. He held strongly to the view that the work then being pressed upon the Committee of Reference in Pharmacy was not what was originally intended when the Committee was appointed, viz., with a view to answering specific points in connection with pharmacy, whilst those of us who have worked upon this Committee now know that it has been a Committee which had revised to the best of its ability practically every monograph of the *British Pharmacopœia.*

It is true that Professor Greenish, Pharmaceutical Editor of the *British Pharmacopœia*, is one of the Professors of the Pharmaceutical Society, and he is acting conjointly in the final editorial work with Dr. Nestor Tirard, but that does not amount to a recognition of equality of the practising pharmacists, who have contributed much to the knowledge that will be contained in the new *British Pharmacopœia.*

How Foreign Pharmacopœias are Revised

Having considered the relative positions in the United Kingdom of the medical profession and pharmaceutical calling as regards pharmacopœial revision over the past century, it will be convenient to review the conditions of pharmacopœia revision in the principal countries.

It will be remembered that the delegates sent to the International Congress of Pharmacy at Brussels by the Pharmaceutical Society of Great Britain stated that this country appears to be the only one in which the National Pharmacopœia is compiled by a Commission from which pharmacists are excluded. Although this statement is not absolutely accurate, it is correct in so far as the only other Pharmacopœia, from the preparation of which practising pharmacists are excluded, is that of Italy, where the Pharmacopœia Commission is composed of one Professor of Chemistry, one of Pharmaceutical Chemistry, and one of Pharmacology. Reference also to the preface of the Japanese Pharmacopœia shows that although practising pharmacy is not directly represented, there are upon the Committee pharmacists of considerable practical experience, including the Professors of Pharmacy and Pharmacognosy in the Tokio University (the

former of whom is also President of the Pharmaceutical Society of Japan), together with an Apothecary (Pharmacist) Colonel of the Japanese Army, one Chief Apothecary (Pharmacist) (1st Class) of the Japanese Navy, and the Chief Apothecary (Pharmacist) of the Imperial Court. In addition the Committee includes chemical experts representing the Imperial Sanitary Laboratory, and the Metropolitan Police Office. It may be mentioned in connection with the publication of this Pharmacopœia that the first meetings of the Committee were held at the Home Office. The Committee was elected in 1904, the revision being completed in March, 1906, and the Pharmacopœia was published in 1907—a very rapid revision, as will be seen.

Coming then to the Pharmacopœias in whose revision medicine and pharmacy are almost equally represented officially, it may be convenient to review the conditions of appointment and revision under which such Commissions or Committees work.

Deutsches Arzneibuch

5 *Ausgabe,* 1910

The German Pharmacopœia Commission appointed in 1886 was in 1900 superseded by the Health Council of the Empire, which in conjunction with the Imperial Health Office was entrusted with the preparatory work for the regulation of the Diet concerning the periodical additions and corrections to be made in the Pharmacopœia. According to the regulations issued by the Imperial Chancellor, with the approval of the Diet, a series of Committees was formed, of which the two Sub-Committees of the Committee for Medicines, namely the Medical and Pharmaceutical Sub-Committees, had to do the work of the former Pharmacopœia Commission. There are twenty-six members on these Sub-Committees. They are experts, and include representatives of clinical and practical medicine, pharmacology, applied chemistry, pharmacy, pharmacognosy, and bacteriology, also medical representatives of the more important Federal States. Members of the Health Office and experts in special subjects may if necessary be invited to take part in the discussions of the Health Council of the Empire. The President of the Imperial Health Office is the Chairman, and he also conducts the business of the Committee.

In connection with the revision of the last German Pharmacopœia, the President of the Imperial Health Council invited in July, 1906, all pharmacists, physicians, and veterinary surgeons to make known their desires and proposals for the Fifth Edition, especially as regards the addition or omission of Articles, whilst on the instruction of the Imperial Chancellor 125 proprietors of large pharmacies in town and country were asked to state what medicines contained in the Pharmacopœia were seldom or never ordered, and this information was placed at the disposition of the Health Office. The information thus obtained served as a basis for the Committees of the Health Council of the Empire. It was agreed that the Pharmacopœia was in the first place to be regarded as an official book of formulæ, and that this character should be retained, but it was further decided that it should be made more useful to apprentices and students, and also to physicians, without making it in any sense a textbook. Six members of the Working Committee were chosen as an Editorial Committee, and the final revision was completed in 1900, the Diet approving the draft in November of that year.

Codex Medicamentarius Gallicus

Pharmacopée Française

The French Pharmacopœia is edited by a Commission appointed by the Minister of Public Instruction. Formerly, this Commission was dissolved when the Codex had appeared. Now it has been replaced by a permanent Commission for editing the Codex and its Supplements, which sits in the Ministry of Public Instruction. It is presided over by the Director of Higher Education, a high functionary who comes immediately after the Vice-Rector of the Academy of France. In Paris the Rector is the Minister himself. The Commission has a Vice-President and three Secretaries, one of the latter, or Administrative Secretary, being an Officer of the Ministry (Chef de Bureau), and the others Members of the Commission, these being the Technical Secretaries, one for Chemical Pharmacy and one for Galenical Pharmacy. The Administrative Secretary deals with reports of the meetings, centralises the work, receives the edited monographs, transmits them to the printer, receives proofs, sends three copies to each member of the Commission, has charge of the body of the book,

sends out the summons of the meetings, etc. Each of the Technical Secretaries has a list of the monographs which have to be revised. He keeps himself and also the members of the Commission informed as to the progress of the work; he records the monographs sent back for correction, and notes the observations made at the meetings and the decisions arrived at.

At the commencement the full Commission meets and decides upon the size of the page of the Codex, the type to be used, the quality of the paper, and similar details. Then it is divided into three Sub-Commissions, each of which is presided over by a President. The divisions are :—

(1) Sub-Commission for Chemical Pharmacy
(2) Sub-Commission for Galenical Pharmacy
(3) Sub-Commission for Materia Medica

One member of the Commission is specially charged with the editing of the monographs of veterinary medicine, another with those of the serums, extracts of animal organs, and the like.

Each Sub-Commission first decides what articles are to be retained, what are to be deleted, and what new ones are to be introduced. The decisions are submitted to the full Commission. The titles of the monographs being fixed, the Sub-Commissions set to work. Each monograph is first approved by the Sub-Commissions, then submitted to the full Commission, which votes for it to be set up. The proofs, printed first on one side, are corrected by the Authors and read again in the Sub-Commission and in the Commission. The corrected proofs are sent back to the printers, who return corrected proofs (revises) which undergo the same examination as the first. This work is repeated a third time. The monographs are then made up into pages, one proof and a revise being examined. The monographs are therefore examined five times in all.

During this time the printer has to keep the whole of the book in type, and this means holding up type worth 60,000 to 70,000 francs for several years. As an arrangement of the monographs in alphabetical order has been adopted for the Codex, no other method is possible if one wants to add or delete articles.

When all this work is finished a printing Commission is nominated from amongst the members of the full Commission to supervise the work of printing. The printing and the right to sell the Codex are given to the publisher who offers the lowest sale price

to the public, the Minister for Public Instruction inviting tenders for the contract, which is given to the publisher who undertakes to sell to the public at the lowest rate per sheet of sixteen pages, recto et verso (i.e., printed both sides). As the preface states, the Codex does not cost the State anything. The publisher (Masson) undertakes to set the book up entirely and keep to the type set until it is printed. Further, he has paid the State the sum of 45,000 francs, which has been used to pay the editors, being divided between them in proportion to their attendances at the Committee Meetings.

The full Commission met every seven or fourteen days, according to the importance of the work done by its members. In each Sub-Commission the work was divided amongst the members by the President. Each editor took charge of a certain number of monographs until the order to print was given. The method of working is very slow, and the revision of the Codex required eleven years. A new one would not have taken so long. Each of the members of the Sub-Commissions worked in his own laboratory and with his own personal resources : no money being provided for material, products, or work. The Sub-Commissions met at the Laboratory or house of the President.

A Supplement to the Codex will be published next year, and errors in the 1908 edition will be corrected.

Pharmacopœa Helvetica

The methods of publication and revision of the Swiss Pharmacopœia are extremely interesting. The Swiss Apotheker Verein, i.e., Pharmacists' Association, appointed in 1897, in connection with the revision of the Pharmacopœia last published in 1893, a permanent Pharmacopœia Commission, which received a subvention from the Federal Council. Up to the end of 1902, when it was dissolved, the Commission had dealt with 115 monographs. At that time, however, by a decision of the Federal Council, an official Swiss Pharmacopœia Commission was appointed, with powers, it being divided into two sections, one a Pharmaceutical Section with seventeen members and thirteen assistants, and the other a Medical Section with ten members and nine assistants, the conduct of the business being placed in the hands of a Committee consisting of three directors selected by the General Council.

The Commission was divided into the following Sub-Commissions :—

1. Sub-Commission for crude drugs.
2. ,, ,, inorganic preparations
3. ,, ,, organic preparations
4. ,, ,, galenical preparations
5. ,, ,, wines
6. ,, ,, sera, etc.
7. ,, ,, tables of doses, etc.
8. ,, ,, chemical pharmaceutical tables
9. ,, ,, editorial Commission.

In 1902 the monographs were distributed to the members of the Sub-Commissions, and the work of revision was proceeded with so rapidly that although much of the Pharmacopœia was remodelled the text was delivered to the Federal Council for approval in the beginning of 1907.

Pharmacopœa Austrica

The last edition of the Austrian Pharmacopœia, published in 1906, is one of which pharmacy may be justly proud. It was compiled by the Pharmaceutical Committee of the Supreme Sanitary Council, consisting of experts in the sciences involved, of pharmacists appointed by the Head Association of Vienna, and of the Apotheker Verein of Vienna. In the first instance, on the instruction of the Imperial Ministry of the Interior, the Committee prepared everything necessary for the new edition by issuing a descriptive report giving the necessary guiding considerations.

Having agreed upon the principles, the Colleges and the Hospitals of Vienna, and also various clinical professors, were invited to express an opinion as to which medicines should be retained, and what methods of preparation should be improved. The whole of the reports and opinions obtained from various parts of the Empire were arranged by the Supreme Sanitary Council and handed over to the Pharmaceutical Committee and a Pharmacopœia Commission in order that proper regard might be given to the requirements of the country.

Pharmacopœa Española

Revision of the Spanish Pharmacopœia was entrusted by the Government to the Royal Academy of Medicine, Madrid, which

appointed a Committee of eight of its members, half of whom were physicians and half pharmacists. The Spanish Pharmacopœia is enforced by a Royal Decree after submission to the Ministry.

The Pharmacopœia of the United States

Coming last of all to the United States, it may be said of this Pharmacopœia that it stands alone as a work elaborated by private associations without any mandate or authority from the Federal Government, and it is, as is well known, revised by a Committee consisting almost equally of members of the medical profession and the pharmaceutical calling. It is naturally regarded as an anomaly that this work should be utilized as a legal standard for the enforcement of the Federal Pure Food and Drugs Act.

Incidence of Pharmacopœias on Business

Having reviewed the methods of compilation, revision and publication of the more important Pharmacopœias, it is desirable to consider how far these works are of a legislative character, and how far the rules and regulations published in these Pharmacopœias affect the exercise of the pharmaceutical profession.

It must be conceded that the Statutes regulating pharmacy in many of these countries are much more stringent, and perhaps more irksome, than those regulating pharmacy in Great Britain and Ireland. Certain of the foreign Pharmacopœias indicate for each powerful drug maximum single and daily doses, which the pharmacist in dispensing any prescription may not overstep unless the prescriber has sanctioned the increased dose by a special sign. Moreover, they give instructions regarding the storage of pharmaceutical preparations and poisons, with indications as to those which must be kept protected from light or otherwise preserved. Other Pharmacopœias give a list of preparations which may not be sold outside pharmacy, and also of those which the pharmacist may not sell without the production of a medical man's prescription. In others also we find a list of official preparations, and even in some cases the minimum quantities, which must be stocked in every pharmacy, as well as apparatus and analytical requisites. The French and Italian Pharmacopœias even go so far as to include the laws and regulations bearing upon

pharmacy and the punishments which may be meted out to those who do not obey them.

It must not be forgotten that in the United Kingdom the Pharmacopœia, although a standard to the prescriber and dispenser, is not an authority under the Sale of Food and Drugs Acts, although as we shall hear probably in the discussion at the Practice Section of the Conference to-morrow, it is usually accepted in the absence of any other authority as the proof and standard. It will be remembered also that under the Pharmacy Act, 1868, the Pharmaceutical Society has power to enforce the dispensing of prescriptions in accordance with the formularies of the *British Pharmacopœia* as far as they apply. I am not aware, however, that any action has at any time been taken by the Pharmaceutical Society in that connection. I see no reason however why, even though the pharmaceutical calling be recognized as on an equality with the medical profession in the compilation of the Pharmacopœia, any greater restrictions should be placed upon the conduct of the business of the pharmacist than there are to-day, for the work of the Pharmaceutical Society makes it evident that it has been active and most fair in safeguarding the interests of the public.

Having thus considered the position of the physician and pharmacist in revising, and the methods of publication of, the *British Pharmacopœia*, and the methods of revision and publication of the Pharmacopœias of the world, we come to a consideration of

The Problems of the Future

There can be no question that the rights of the General Medical Council to publish the *British Pharmacopœia* can only be overruled by an Act of Parliament, and, as I have already stated, in my opinion the present is an opportune time for the promotion of a Bill for that purpose. It is not clear from reference to old records whether any compensation was given to the bodies which published the Dublin, Edinburgh, and London Pharmacopœias when their works were absorbed by the General Medical Council, but at any rate the copyright of the Pharmacopœias of 1864, 1867, 1885, the Addendum of 1890, and the Pharmacopœia of 1898, are vested in the General Medical Council. It has never been possible to ascertain what profits have been made by the General Medical Council out of the publication of the

British Pharmacopœia, in fact the accounts would appear to indicate that very little profit has been made, but one looks for a reason for the refusal of the General Medical Council to co-operate on an equality with the Pharmaceutical Society in the publication of the Pharmacopœia, and surely that can only be found in the fact that there must be certain profits obtainable from the publication of the work. When one considers that 45,000 copies of the Pharmacopœia of 1898 have been sold (and by the way probably three quarters of them to those actively engaged in pharmacy) there should have been a very considerable profit if one takes into consideration the selling price of the Pharmacopœia, as compared, for the sake of argument, with the French Codex. The *British Pharmacopœia* is published at 10*s*. 6*d*., and consists of 535 pages, whilst the last edition of the French Codex was published at Frs. 9.50 (8*s*.), and consists of 1,000 pages. If therefore no profit has been made from the publication of the *British Pharmacopœia*, then the work cannot have been carried out economically. One may surmise nevertheless that some profit has been made out of the *British Pharmacopœia*, and it is for that reason that the General Medical Council is loth to part with the right of publication.

It has been alleged that the General Medical Council has no power to elect members of the Pharmaceutical Society or nominate members of the Pharmaceutical Society on the Pharmacopœia Committee, so that the Committee of Reference in Pharmacy holds a subordinate position. Reference to the Medical Act of 1858 and the subsequent Act of 1862 does not confirm this statement. The only duty placed upon the Council by Statute is that of producing the Pharmacopœia under its supervision and authority. There are no regulations as to who shall help, or the position of authority or otherwise that shall be given to those who do help. Moreover, pharmacists were on the first British Pharmacopœia Committees, Mr. Peter Squire being associated with the London one and Mr. James Robertson on the Edinburgh one.

The question therefore that arises at the present time is, how the position can be best attacked, and how the pharmacist may secure the position in the making of a Pharmacopœia such as our confreres in every other country have. It has been suggested that it might be possible, now that the State has recognized both departments of medicine, that the Government might introduce a measure dealing with the subject, but our Government at the

present time has its hands full of promised legislation, and from a Parliamentary point of view perhaps the position is not opportune. I would suggest therefore that the Pharmaceutical Society give its most earnest and careful consideration to a Bill on the lines of that which I shall refer to shortly, and having considered it in all its bearings, submit it with a petition to the Privy Council, in the hope that the Privy Council may see fit to introduce such a Bill into Parliament. On consideration of the whole subject, and the history as set out in the remarks that I have made, one would imagine that that Authoritative Body would see the fairness of the step that is proposed, and further would attempt to bring the positions of medicine and pharmacy in this country into line with those of other countries. Failing that, however, there would be no objection whatever, in fact it would be advisable, that the Bill should be introduced into Parliament by the Parliamentary Secretary of the Pharmaceutical Society, into whose hands I am confident it could be safely entrusted.

It must be distinctly understood that if, under the Sale of Food and Drugs Acts, the Pharmacopœia is to be made the standard, then the revision of the work must be done with that purpose in mind, and it will of necessity be on somewhat different lines to those which have been adopted in the revision of the Pharmacopœia so shortly to be published.

In the Pharmacopœia, now in preparation, items that have hitherto appeared in the Indian and Colonial Addendum will be included in the body of the work, and in that way the work will be given a more Imperial character than has hitherto been the case.

Whilst under the Sale of Food and Drugs Acts in this country no standard has been deliberately recognized, in certain of our Colonies the *British Pharmacopœia* has been accepted as a standard, and I have thought it well therefore that in drafting a Bill which should cover the important problems of revision of the Pharmacopœia for the future, it should be on the lines of an Imperial Pharmacopœia, in which there should be representations not only of Medicine and Pharmacy in the Mother Country, but also in India and the Colonies. I refer to the text of the Bill, which in my humble opinion fairly represents the accurate positions of the medical profession and the pharmacist, and I trust that it will receive the most earnest consideration, first of all of our pharmaceutical advisers, and subsequently of the Members of the Privy Council.

An Act to provide for the publication of a BRITISH IMPERIAL *PHARMACOPŒIA*, and for the periodical revision of the same.

Be it enacted by the King's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal and Commons in this present Parliament assembled, and by the authority of the same as follows :—

I (1) There shall be constituted for the purposes of this Act a Commission to be called "The British Imperial Pharmacopœia Commission," consisting of the following members :—

Six duly qualified Medical Practitioners, two of whom shall have had personal experience of general practice, to be nominated by the General Medical Council.

The Professor of Pharmaceutics in the School of Pharmacy of the Pharmaceutical Society of Great Britain.

Three Registered Pharmacists, one of whom shall have had practical experience in the wholesale commerce of drugs, and in the manufacture of pharmaceutical preparations on a large scale, to be nominated by the Council of the Pharmaceutical Society of Great Britain.

Two Registered Pharmacists, to be nominated by the Council of the Pharmaceutical Society of Ireland.

One duly qualified Medical Practitioner who shall have had personal experience of medical practice in the Indian Empire, to be nominated by the Secretary of State for India.

One Registered Pharmacist, who shall have had personal experience of pharmaceutical practice in the Empire of India, to be nominated by the Secretary of State for India.

One duly qualified Medical Practitioner, who shall have had personal experience of medical practice in a British Colony, to be nominated by the Secretary of State for the Colonies.

One Registered Pharmacist, who shall have had personal experience of pharmaceutical practice in a British Colony, to be nominated by the Secretary of State for the Colonies.

The Chief Government Chemist.

One Analytical Chemist, who shall have held an appointment as Public Analyst to a County or Borough Authority for not less than ten years, to be nominated by the Council of the Institute of Chemistry of Great Britain and Ireland.

A Barrister-at-law of not less than five years standing, to be nominated by the Treasury. Such nominations shall be submitted to the Privy Council, by whom they shall be formally approved and gazetted. In the event of any vacancy occurring in the constitution of the Council the body which nominated such members shall nominate another person as defined herein to succeed to the vacancy subject to the approval of the Privy Council as aforesaid.

(2) The Commissioners shall appoint from their own number, a person to act as their Chairman, and may appoint such officers and servants, (including physicians, surgeons, pharmacists, analytical chemists, and any other persons specially qualified to conduct researches into the constitution and uses of drugs and other medicinal agents, and in elaborating processes for the manufacture and testing of drugs and other medicinal agents, so far as the compilation and revision of the British Imperial Pharmacopœia is concerned) as the Commissioners, subject to the approval of the Treasury as to number, may determine, and there shall be paid out of moneys provided by Parliament to the Commissioners, and to such officers and servants, such salaries or remuneration as the Treasury may determine, and any expenses incurred by the Treasury or the Commissioners in carrying this Act into effect, to such extent as the Treasury may sanction, shall be defrayed out of moneys provided by Parliament.

II The Commission shall prepare and cause to be published a book containing a list of medicines and compounds and the manner of preparing them, together with the true weights and measures by which they are to be prepared, and mixed, and containing such other matters and things relating thereto as the

Commission shall think fit, to be called "The British Imperial Pharmacopœia," and the Commission shall cause such Pharmacopœia to be altered, amended and republished periodically as hereinafter provided.

III The exclusive right of publishing, printing and selling the said Pharmacopœia shall vest in the Commission, subject to the proviso that it shall be lawful for the Treasury from time to time to fix the price at which copies of the said work are to be sold to the public.

IV Section 54 of the Medical Act, 1858 (21 and 22 Victoria, C. 90) and Sections 2 and 3 of the Medical Act, 1862 (25 and 26 Victoria, C. 91) are hereby repealed as from the date of the publication of the British Imperial Pharmacopœia.

V All questions as to the inclusion in the British Imperial Pharmacopœia of any drug, chemical, or medicinal preparation, shall be determined by those members of the Commission who are duly qualified medical practitioners, alone, and all other matters relating to the Pharmacopœia shall be determined by the Commission as a whole.

VI The standards of purity and strength prescribed in the text of the British Imperial Pharmacopœia shall apply only to substances which are professedly bought, sold or dispensed for medicinal purposes.

VII Any drug, chemical or preparation sold for medicinal purposes, under or by a name recognized in the British Imperial Pharmacopœia, which fails to correspond to the standard of strength, quality, or purity laid down or as determined by the tests laid down in the British Imperial Pharmacopœia, shall be deemed not to be of the nature, substance or quality demanded by the purchaser, unless the fact that it does not or may not correspond to the standard of the Pharmacopœia be plainly stated upon the bottle, box, vessel or wrapper in which it is contained, and unless the seller can prove to the satisfaction of a judicial authority that the standards of the Pharmacopœia for the substance in question are not such as can be reasonably applied to such substance, or that the

tests laid down in the Pharmacopœia are not such as to give accurate results and information, or are not suitable for the substance in question.

VIII (1) Before the British Imperial Pharmacopœia shall be published the Commission shall publish, in such manner as they may think best adapted for informing persons affected, notice of the proposal to publish the Pharmacopœia, and of the place or places where draft copies of the Pharmacopœia may be obtained, and of the time, which shall not be less than three calendar months, within which any objection made with respect to the draft Pharmacopœia, by or on behalf of persons affected, must be sent to the Commission.

(2) Every objection must be in writing, and must state :—

(*a*) The portion or portions of the draft Pharmacopœia, objected to,

(*b*) The specific grounds of objection, and

(*c*) The omissions, additions or modifications asked for.

(3) The Commission shall consider any objection made by or on behalf of any person appearing to them to be affected which is sent to them within the required time, and they may, if they think fit, amend the draft Pharmacopœia in order to meet such objection.

IX When six calendar months have elapsed after the publication of the British Imperial Pharmacopœia in its finally approved form, the said Pharmacopœia shall for all purposes be deemed to be substituted for the *British Pharmacopœia*, and any Act of Parliament, Order in Council or Custom relating to the *British Pharmacopœia* shall be deemed, after the publication of the British Imperial Pharmacopœia, to refer to the British Imperial Pharmacopœia. Notice in the London, Edinburgh, and Dublin Gazettes to the effect that the British Imperial Pharmacopœia has been published shall be deemed sufficient evidence of its publication for the purposes of this Act, and a copy of the said Pharmacopœia printed by such person as may be named in the said

notice or in any other notice published in the said Gazettes, as authorized by the British Imperial Pharmacopœia Commission to print the said Pharmacopœia, shall be admitted in evidence as being the Pharmacopœia directed to be published by this Act.

X The Commission shall cause the British Imperial Pharmacopœia to be revised regularly, and shall at intervals, not exceeding twelve calendar months, publish reports embodying any proposed alterations in, additions to, or withdrawals from the said Pharmacopœia, and such reports shall be published in draft and may be objected to in the manner hereinbefore provided, but after they have been finally approved as hereinbefore provided they shall have the full force and authority of the British Imperial Pharmacopœia, until superseded by a later report or a new edition of the said Pharmacopœia.

XI The Commission may issue special supplements to the British Imperial Pharmacopœia dealing with the requirements of the Empire of India, or of any British Colony, as they may deem fit, and for that purpose may obtain the co-operation of persons having special knowledge of such local requirements.

XII The new editions of the British Imperial Pharmacopœia shall be published at regular intervals not exceeding ten years.

XIII This Act may be cited as the British Imperial Pharmacopœia Act.

Ladies and Gentlemen: We who are gathered here to-day represent not merely the Pharmacy of these Islands of the Sea, but Pharmacists of the British Empire, and I have felt that in celebration of the Jubilee of this Imperial Body, no subject can be more appropriate than the exposition of our interests in the British Pharmacopœia, that link which binds all of us, North and South, in the Orient and the Occident. I trust that this Conference shall not have gone many years in its second half-century before the reformation which I advocate comes into being as an actuality.

Vote of Thanks to the President.

Mr. S. R. Atkins said he felt that a great honour was conferred upon him when he was asked to propose that the best thanks of the meeting be given to the President for his admirable address. It was worthy of remembrance that this was the Jubilee and no ordinary occurrence, and when he saw such a large audience, it seemed that it was a true Jubilee occasion. It was an occasion for the expression of the deep emotion of their hearts that they had reached the fiftieth year of the existence of the Conference. He would give the names of a few of the men who were the fathers of progress during that long period. He thought of Attfield, Brady, Deane, Hanbury, Stoddart, Groves, Schacht and Reynolds, whose life was full of grace and gracious deeds. As to the President's address, he (the speaker) could commend it to them in the ancient formula—"read, mark, learn, and inwardly digest." With regard to the President himself he wished to be permitted, even in his presence, to say one or two words of very earnest, hearty congratulation. There was a well-known formula which said: "When men rise well it is owing to heredity and environment." No doubt they were two very powerful factors in the development of character and of success, though many great men had risen in the world without these advantages. There was the great sculptor Thorwaldsen. He was the son of a ship's carpenter in Copenhagen, and passed on by his own wonderful energy and capacity until he became one of the greatest sculptors of the world. There was Abraham Lincoln, one of the best Presidents the United States ever had. He was only a canal boy and he became President of America, and so he might go on. But that was not the point. He wanted to say that they had in their President a man of whom they were justly proud, and they were thankful that they had him for their Jubilee year. He would not say more, although he felt many things pressing upon his heart and brain, but would move: That the very best thanks of this Conference, representing as it does the whole world of pharmacy, not only Great Britain and Ireland, not only our Indian Empire, our Colonies, and the other Dominions beyond the Seas but practically the whole world on which the sun never sets—be accorded to the President for his presence and for the address he had given them.

Mr. N. H. Martin, in seconding the motion, said that they had heard a magnificent *précis* of the work of pharmacopœia revision. The President had mentioned that the General Medical Council

sought the best pharmaceutical assistance they could obtain. He (the speaker) was one of those who took part in the controversy with regard to the appointment of the three professors of the Pharmaceutical Society as editors of a new Pharmacopœia; he held that the General Medical Council were mistaken in thinking that they had the concentrated wisdom of pharmacy in the persons of these three professors, eminent though they were. Mr. Charles Umney would bear him out when he said that the work of the Committee of pharmacists which assisted the General Medical Council was greatly hampered by the medical Committee. Frequently decisions that had cost them weeks of experimenting were rendered useless because the General Medical Council would not adopt the same views. It would be an enormous advantage when pharmacists were an integral part of the Pharmacopœia Committee. He would not attempt to comment upon the Draft Bill; there were difficulties in the compilation of an Imperial Pharmacopœia, but if these difficulties could be overcome, the boldness, courage and energy of their President would help them forward. He thought there was not the slightest reason why the Colonies should not adopt the British Pharmacopœia, and he would read an extract from a letter he had received from Prof. Remington of the United States in which he said, "English-speaking people should have pharmacopœias which, so far as is possible, are in accord." To-day, probably more people travel between Great Britain and the American Continent than used to travel fifty years ago between London and Newcastle. It should be possible for a prescription written in London to be dispensed in New York or Ottawa within a week.

Mr. Charles Umney said that having filled the presidential chair at Newcastle in 1889, and subsequently at Leeds, he was well aware that it was a little outside the rules and regulations that speakers should comment upon the Presidential address. But as a practical pharmacist, and as an old Pharmacopœia worker, he thought he was qualified to speak on most of the points upon which the address bore. There probably was not a man in the room who had dabbled in Pharmacopœia making for a longer period than he had. In the year 1863 he was with John Bell & Co., and his good friend Hyde Hills told him that he might expect daily, or even hourly, Sir Alfred B. Garrod, who at that time was acting for the General Medical Council in raking the new British Pharmacopœia from the embers of the London, Edinburgh and Dublin Pharmacopœias. The last occasion on which he

worked on a Pharmacopœia was on the Committee of the 1898 Pharmacopœia. Now that recent legislation had recognized the pharmacist he saw no good reason why pharmacists should not be recognized in the making of the Pharmacopœia nor why an Act of Parliament on the broad lines laid down by the President should not be passed. He thought if the matter was left in the hands of the President, provided he had the support of those present and the help they could get through their representation by Members of Parliament that within a very few years the work of pharmacists would be recognized by legislation in the direction indicated.

The President thanked Mr. Atkins and Mr. Martin for the very kind words they had used. He took it as a great compliment to be asked to give the address and he also felt it a great responsibility. He had drawn up the address with a view of trying to do something more for pharmacy than he had hitherto done. He greatly appreciated the very kind remarks that had been made and he also felt highly honoured by the presence of so many Past-Presidents on the platform.

Report of the Executive.

Mr. H. Finnemore read the annual report of the Executive Committee.

In presenting its annual report, the Executive Committee feels that it is most appropriate that the third visit of the British Pharmaceutical Conference to London should coincide with its Jubilee, and at the outset it would express its appreciation of the efforts of the Local Committee of the Pharmacists of the Metropolis who have devoted time and energy ill-spared from other exacting demands in perfecting the very complete arrangements that have been made for the comfort and enjoyment of the visitors to the Annual Meeting.

The Executive reviews with some satisfaction the progress that has been made in fulfilling the objects for which the Conference was established in 1863. On the social side there is no doubt of the benefit to the members of the craft of the opportunity thus afforded of meeting periodically, while with regard to the scientific work over 1,100 papers and notes have been contributed to its Scientific Sessions. These may be roughly grouped into (*a*) those dealing with an extension of our knowledge of the chemistry of drugs, and (*b*) those designed to improve

pharmaceutical preparations. In both cases this knowledge has had direct beneficial bearing upon the quality of drugs and hence upon the prestige of the craft.

The Executive felt that an attempt should be made to celebrate this unique occasion ; it has therefore invited all the honorary members, as well as distinguished Continental pharmacists and pharmacists from the British Overseas Dominions, to participate in the present meeting.

All these have expressed in felicitous terms their pleasure on receiving the invitation, and those who have been compelled to decline have done so with evident regret.

Representatives are present from France, Holland, and from the Pharmaceutical Societies of South Australia, New South Wales and South Africa, and scientific contributions have been received from Germany and Holland.

The Executive Committee cannot refrain from expressing its deep sense of sympathy with those responsible for the conduct of Pharmaceutical affairs during the past year. Pharmacy has passed through a period of anxious suspense probably never exceeded in its history, and congratulations are due to members of the craft on their first recognition by the State as the proper persons to act as dispensers of medicine.

The Executive desires to extend its warmest congratulations to Mr. Edmund White, a former Honorary Secretary of the Conference, on his election as President of the Pharmaceutical Society of Great Britain.

On the recommendation of the Practice Section Sub-Committee, consisting of the President, Messrs. F. W. Gamble, E. F. Harrison, E. T. Neathercoat, E. S. Peck, and the Secretaries, the Executive has decided that at the meeting of this section on Tuesday, July 22, a discussion will be held on "The Operation of the Food and Drugs Act."

The Research Sub-Committee (consisting of the President, Messrs. F. W. Gamble, E. F. Harrison, C. A. Hill, E. M. Holmes, F. Ransom, and the Secretaries) was re-appointed last October and proceeded to revise the Research List.

It was recognized that membership of the Conference includes both those who have the opportunity of conducting research, and also many who meet with practical difficulties, but whose opportunities do not readily lend themselves to research work. An attempt was therefore made to connect these two sections. Invitations were addressed through the Journals to the general

body of the craft and also directly to many large manufacturing houses who it was thought might assist. Considering this was a new experiment, the Sub-Committee was gratified to receive so much help.

In addition, an attempt was made to co-operate with the Research Committee of the British Medical Association. The mutual assistance of medical and pharmaceutical workers might produce very valuable results in perfecting medical treatment. Unfortunately, partly owing to the troubled state of medical politics, the scheme has been rather slow in maturing, but the Executive notes with satisfaction that the Medical Committee has now drawn up a list of subjects requiring investigation; these will receive careful consideration.

Mr. R. A. Robinson, one of the Auditors, has resigned. The Executive desires to thank him for his services in this capacity during the last two years.

Following up the suggestion made in Sir Edward Evans' Presidential address at the Edinburgh meeting last year, the following members of the Conference were asked to give evidence before the Dominions Royal Commission on the Cultivation of Drugs. The President (Mr. J. C. Umney), Messrs. K. C. Allen, J. H. E. Evans, E. M. Holmes, F. Ransom, and Professor H. G. Greenish.

In connexion with the present meeting the Executive has addressed a letter of invitation to every registered pharmacist in the London area, and notes with satisfaction an accession of nearly two hundred new members, chiefly derived from this area.

The Executive learns with much pleasure that an invitation to visit Chester in 1914 will be proffered at the present meeting, also that the pharmacists of Scarborough wish to honour the Conference similarly in 1915. The Executive welcomes these signs of the continued popularity of the Conference and the desire of pharmacists in such varied localities to extend hospitality to their fellow-members.

Mr. G. Claridge Druce moved the adoption of the report. It covered a wide ground, and he regarded it as eminently satisfactory in all its points. He felt sure it would meet with the enthusiastic support of the Conference. He would like to say how sorry he was that he could not be present during the whole of the Conference, as he had to take the chair at a meeting at Oxford in connexion with a scheme regarding tuberculosis and the National Insurance Act. The President's Address had been worthy of the audience, and he hoped it would have practical

results. He remembered that at the Dublin meeting the question was whether the Conference should be ended or mended, but all would now see how important the Conference was, and he hoped that when medical politics had become more settled the wishes of the address would be fulfilled. There would surely be very few who would advocate the ending of the Conference, and it would not be easy to say "mend" even, because it was already so near perfection. In heartily proposing the adoption of the report, he expressed his satisfaction at the invitations to hold future Conferences at such delightful places as Chester and Scarborough.

Mr. F. Ransom, in seconding, said he had had considerable experience with his friends Naylor and Peck in drawing up annual reports, but they had seldom or never had a more satisfactory report than that now presented. The number of new members was very gratifying, and he hoped that the Conference would long retain them. The most satisfactory point in the report was the attempt which had been made to co-operate with the Research Committee of the British Medical Association.

The report was unanimously adopted.

Treasurer's Report.

Mr. D. Lloyd Howard (Treasurer) presented the balance-sheet for the year ending December 31, 1912. He said that with regard to the accounts for 1912, there is not much to be added to the circular which was sent with the account, except that it may be of interest to note that 169 subscriptions were of sums over the Conference minimum of 7*s.* 6*d.*, ranging from 8*s.* to £1 1*s.*

It is to be hoped that as many members as possible will follow the good example of their 169 colleagues.

Up to the 16th inst., the subscriptions received amounted to £315 as against £320 for the corresponding period of last year. A disquieting feature of the position is that no fewer than 450 members have not paid their subscriptions as compared with 180 last year. It is hoped that the causes which have led to non-payment may prove to be merely temporary, and that we may yet obtain the financial support of those members before the end of the year.

He added that it was very desirable that those who had not

paid their subscriptions should do so as soon as possible, because it was of the greatest assistance to the Executive to know how many copies of the Year-Book to print. He appealed to the 450 persons referred to to pay their subscriptions.

SIR EDWARD EVANS proposed the adoption of the report. He hoped that those particularly who had not paid their subscriptions would read the magnificent address which had been delivered by the President; it would be evident to them what good value they were receiving for the subscription. He did not think the craft generally sufficiently recognized the good work which was being done in these rather difficult times, both by the Pharmaceutical Society and by the members of the Executive Committee of the Pharmaceutical Conference.

MR. T. H. W. IDRIS seconded the adoption of the report. The motion was carried unanimously.

RECEIPTS AND EXPENDITUR

Dr.

1912.		£ s. d.	£ s. d.
Dec. 31.	To Members' Subscriptions received by Secretaries	368 14 8	
	,, ,, ,, paid through Bank	6 4 6	374 19 2
	,, Amount received for Copies of Reprints and Conference Papers	7 17 6	
	,, Sale of Year Book by Publishers	12 12 2	
	,, ,, ,, ,, Secretaries	1 7 6	
			21 17 2
	,, Advertisements in Year Book		67 1 6
	,, Deficiency		7 17 10
			£471 15 8

LIABILITIES.

McCorquodale	2 0 0	
Ellams Duplicating Co.	2 12 6	
Ash & Co.	1 11 9	
Butler & Tanner	135 16 11	
Assistant Secretary	8 15 0	
H. Kimpton	6 15 6	
Bell & Hills Fund	14 13 9	
		172 5 5

BELL AND HILLS FUND.

1912.		£ s. d.	£ s. d.
Jan. 1.	To Balance from 1911	12 19 7	
	,, Dividend on Consols	8 9 8	
			21 9 3
	By Kimpton's Account for Books		6 15 6
			£14 13 9

Assets :—
£360 Consolidated 2½% Stock.

January 29, 1913.

CAL CONFERENCE,

R ENDING 31st DECEMBER, 1912.

Cr.

1912.		£ s. d.	£ s. d.
Jan. 1.	By Balance from last year (Deficit) .		14 9 8
Dec. 31.	,, EXPENSES OF YEAR BOOK (1912) :—		
	Printing, Publishing and Binding	212 11 9	
	Posting and Distributing . .	19 11 2	
	Reprints	3 14 0	
	H. Wyatt, £10 ; F. W. Gamble, £10	20 0 0	
	Advertising, 10*s.* 6*d.* ; Publishers' Charges, 2*s.*	0 12 6	
			256 9 5
	,, Commission on Advertisements .		16 15 5
	,, Editor's Salary		75 0 0
	,, Assistant Secretary at Annual Meeting .	5 8 0	
	,, ,, ,, Salary .	35 0 0	
			40 8 0
	,, Postages, £12 18*s.* 6*d.* ; Editor, 9*s.* 9*d.*	13 8 3	
	,, Petty Cash, Sundries . . .	8 14 7	
			22 2 10
	,, PRINTING, STATIONERY, ETC. :—		
	,, McCorquodale	9 11 3	
	,, Straker	2 3 6	
	,, T. Stephenson	3 13 1	
	,, St. Clement's Press . . .	4 17 6	
	,, A. P. Dixon	1 6 6	
	,, Duplicator	2 12 6	
	,, Ash & Co.	1 11 9	
	,, Typing Circulars, etc. . . .	6 7 9	
			32 3 10
	,, Foreign Journals for Editor . .		5 13 0
	,, J. Duncan — Reporter — Annual Meeting		2 2 0
	,, Barnett & Barnett—Shorthand Writer		5 5 0
	,, Transferring Consols, 11*s.* 6*d.* ; Bank Charges, Cheques, etc., 15*s.* .		1 6 6
			£471 15 8

ASSETS.

,, Cash at Bank	104 7 5	
,, ,, in hand	0 5 4	
,, Due from J. & A. Churchill. .	59 14 10	
		164 7 7
Deficiency		7 17 10
		£172 5 5

THE BRITISH PHARMACEUTICAL CONFERENCE RESEARCH FUND.

1912.		£ s. d.
Jan. 1.	To Balance	25 2 0
Mar. 26.	By Grant (C. H. Hampshire)	1 10 0
		£23 12 0

Examined and found correct and signed on behalf of Auditors,

R. A. ROBINSON.

PAPERS COMMUNICATED TO THE SCIENCE SECTION.

THE STANDARDIZATION OF OPIUM FOR PHARMACEUTICAL PURPOSES—"NORMAL OPIUM"

By Professor P. van der Wielen

The chemical standardization of our drugs and galenicals is based on the determination of one of the active principles or of some of the active principles together.

For instance, we determine in cinchona bark all the alkaloids, if the bark is used for pharmaceutical purposes. Those alkaloids are a mixture of different alkaloids, of which the crystalline ones are much more active than the amorphous ones. The amorphous alkaloids were formerly used, as *Quinoidinum*, but they are now quite obsolete. In one pharmacopœia, the Dutch Pharmacopœia of 1906, we find besides the determination of the alkaloids the standardization of the tannates of the alkaloids. For Semen Strychni all pharmacopœias but one, the British Pharmacopœia, give methods for the determination of the two alkaloids together. The difference between the activity of brucine and strychnine justifies the English in having chosen a more complicated method, and it is to be wondered at that the Conference held at Brussels in 1902 preferred the determination of the mixture of alkaloids.

In the same way we find methods for the determination of the alkaloids together in ipecacuanha root, pomegranate bark, and belladonna leaves, though the activity of the different alkaloids is not at all the same. Especially in the last but one, the Cortex Granati, we find the very active pelletierine and isopelletierine together with the nearly inactive methyl and pseudopelletierine, and it would be much more logical to standardize the pomegranate bark after the method given in the French Pharmacopœia for the preparation of the sulphate of pelletierine, where the active alkaloids are separated from the inactive ones.

In hydrastis rhizome and the liquid extract made from it we only determine the hydrastine, and it is a fortunate circumstance that here the simplest method goes together with the estimation

of the most active principle. If the berberine and the canadine were found to be as active as the hydrastine, the standardization of our Extractum Hydrastis Liquidum would give us so much trouble that I fear in most of our pharmacopœias we should still find the same method. Schneider said many years ago, and not without reason: "Es scheint der Pharmacie eigentümlich zu sein, dasz Grundbedingungen und Regeln eines Arbeitgebietes, zu Günsten der rascheren Erledigung und auf Kosten der Genauigkeit und Exactheit über Bord geworfen, beziehentlich nicht gehörig berücksichtigt oder erkannt wurden" (*Pharm. Centr. Halle*, 1886, S.681). Let us be just to ourselves and not lay the shortcomings of all mankind at the door of pharmacists only, who are in general the most accurate of men.

In the same way as for Rhizoma Hydrastis we find in all pharmacopœias for the standardization of opium only methods for the determination of morphine.

The opposition to the valuation of opium only by the quantity of morphine found in it is not restricted to the present day. The idea of reading a paper on this subject to this jubilee meeting of the British Pharmaceutical Conference occurred to me while reading the "Observations on Opium and its Tests," published in 1830 by Andrew Ure (*Quarterly Journal of Science, Literature and Art* of January to June, 1830, pp. 56-63). Ure mentions that after giving notable quantities of morphine and also of narcotine to dogs no deadly effects are procured. If he gave opium of an equivalent quantity this dose soon proved fatal. Ure says: "Oil seems to be the most potent menstruum of narcotine, for three grains dissolved in oil readily kill a dog, whether the dose be introduced into the stomach or into the jugular vein." "Since a bland oil seems to develop the peculiar force for narcotine, and since opium affords to ether, and also to ammonia, an unctuous or fatty matter, and a resin (the caoutchouc of Bucholz) to absolute alcohol, we are entitled to infer that the activity of opium is due to its state of composition to the union of an oleate or margarate of narcotine with morphia."

This supposition seems to us something strange, but, as Ure writes after this communication, "The meconic acid associated with the salifiable base has no narcotic power by itself, but may probably promote the activity of the morphia." This agrees remarkably with the researches of very recent times. Barth (*Chem. Central.*, 1913, I., 118; *Pharm. Journ.*, 1913, i., 400) has found that the meconate of morphine is 25 per cent. stronger

than the equivalent dose of Morphinæ Hydrochloridum. Straub has found that when narcotine is added to morphine in combination with meconic acid, the narcotic power is increased; he recommends the combination with meconic acid as a double salt under the name of "Narcophine."

I believe that Ure would not have been very surprised if he had attended the evening meeting of the Pharmaceutical Society of Great Britain, held in London on March 11 of this year, where Dr. Jowett stated: "Inasmuch as it is clear that the action is not due to the morphine alone, and as the amounts of the other alkaloids probably vary, and not necessarily in the same proportion as morphine, it follows that standardization of morphine alone does not ensure an invariable preparation, though it is better than no standardization at all."

Ure himself said thirty-three years before the foundation of this Conference: "The weight of morphia obtainable from a given variety of opium may by no means represent the total essence of the drug"; but he is quite wrong where he says: "Morphia exists in the state of a meconate, and its quantity must be in equivalent ratio to that of the meconic acid."

Christison, the well-known professor of materia medica in the University of Edinburgh about seventy years ago, gives in the *Journal de Pharmacie* of 1835 (t. 21, p. 542), in a correspondence, the results of an investigation about different specimens of opium. He writes about the proposition of Ure to estimate the quantity of morphia by the determination of the quantity of meconic acid: "Le moyen du docteur Ure, proposé il y a peu d'années dans le *Journal of the Royal Institution*, par l'estimation de l'acide méconique, est tout à fait impraticable. Je m'en suis assuré moi-même; car la morphine et l'acide méconique ne sont pas en proportion l'un avec l'autre." My own researches have confirmed this judgment of Professor Christison, and I believe that it would be illogical if the standardization of meconic acid were used instead of that of morphine, but it would be better than no standardization at all.

The results obtained with pantopon ought to indicate the direction in which we must look for a better method for the standardization of opium. A determination as is given by Mannich and Schwedes (*Apoth. Ztg.*, 1913, S. 82) for pantopon cannot be the base of a new valuation. On controlling this method I found it quite efficient for the examination of pantopon, but the method cannot be applied to opium. A great part of the

alkaloids stays behind in the mother liquor of an opium solution if after the addition of ammonia it is again and again exhausted with chloroform, isobutylalcohol, and a mixture of these two, and the same process repeated after the addition of sodium hydroxide. In several ways I have tried to find a method that would make it possible to determine the total alkaloids, but I have failed. If I had succeeded in separating the mixture of all the alkaloids from the opium, it was my intention to have given methods to determine in this mixture the principal alkaloids, for instance, the morphine, the narcotine, and the codeine. In this case, too, another quantity of the opium had to be taken for the determination of the meconic acid.

Now that it has been impossible for me to find a method for the determination of all the alkaloids together, I have returned to the methods I gave ten years ago for the determination of the narcotine and codeine in opium (*Year-Book of Pharmacy*, 1903, p. 121, and 1910, p. 28). This method is not so complicated as that of Caspari (*Year-Book*, 1905, p. 65) and of Andrews (*Year-Book*, 1912, p. 21) for the determination of codeine alone, and it has given better results.

For the standardization of morphine I prefer the lime method of the British and Dutch Pharmacopœias to the ammonia method of some other pharmacopœias.

I have found in the study of Ure, already mentioned, a method for the determination of meconic acid.

The method of Ure is : "Get a grain or two of each (of the opiums) dissolved in a little dilute alcohol, and then diffused through such a body of water as will make the liquid nearly colourless. Pour each liquid into a graduated glass cylinder, and add to it a few drops of red muriate of iron. The characteristic brown-red tint will immediately appear, of a depth proportional to the amount of the meconic acid, for the previous dilution with water must be so great as to remove the inequalities of colour in the original spirituous solutions. Let the darker shades be now lightened with water till the tints of the whole be uniform ; and the relative volumes of the liquids will afford an approximate measure of the qualities of the several opiums."

The difficulty in this method is, that if the solution of opium is nearly colourless, the colour that is given with ferric chloride is so faint that no estimation can be based on this. It only compares the quantity of meconic acid in two or more opiums, and gives no absolute quantity. If we compare a solution of opium,

coloured with iron, with a solution of meconic acid, also coloured with iron, we see a great difference in tint between the two solutions, caused by the tint of the opium extract. It is possible to take that difference away by adding some drops of a solution of yellow aniline dye, for instance, of Orange G. or Bismarck-Brown. This may cause sometimes difficulties too, and it is better to purify the opium solution. In a solution of meconic acid the acid is quantitatively precipitated by Goulard's extract, and the method I propose now is as follows: Macerate during twenty-four hours 1 gramme of opium with 100 mils of water, often shaking the liquid. After that time filter and mix 25 mils of the opium solution with 5 mils of Goulard's extract, allow to stand fifteen minutes or more, and transfer the precipitate to a small filter and wash with water until the washing liquid is colourless. Dissolve the precipitate in warm 1/10 N hydrochloric acid till you have exactly 100 mils. This is the solution of the meconic acid of 250 milligrams of opium in 100 mils. The colour of this solution is yellowish. In a measuring flask of 250 mils is dissolved 50 milligrams of pure meconic acid in 1/10 N hydrochloric acid, to this solution is added as much of a 1/10 per cent. solution of Orange G. (about 2 mils) to give it, after having filled it up to 250 mils, the same colour as the solution of the meconic acid of the opium. Put 5 mils of each of the two solutions in a little flask with parallel sides and divided into two parts, as I show you here. The distance between the two parallel sides is a centimeter, and each part of the flask can contain about ten mils. To each of the liquids add one drop of the test solution of ferric chloride, and add to the darker of the two solutions out of a burette as much water as is necessary to obtain the same colour in the two divisions of the flask. In this way it is easy to find the quantity of meconic acid in the opium.

As the result of the examination of four samples of opium I have found:—

	A. Per cent.	B. Per cent.	C. Per cent.	D. Per cent.
Morphine	12·2	14·1	10·5	12·4
Narcotine	5·8	4·8	6·8	7·6
Codeine	1·1	0·7	1·5	0·9
Meconic acid	5·4	4·3	4·5	6·4

From these figures alone it is not possible to fix an aver-

age of the quantity of the various alkaloids that a normal opium must contain. But suppose that we find as the average of the analyses of a hundred samples of opium collected in different years and of different origin a proportion of 12 per cent. morphine, 6 per cent. narcotine, 1 per cent. codeine, and 5 per cent. meconic acid, then it is possible to make from the four samples of opium with higher and lower figures than the average a normal opium that contains the quantity of each principle wanted. For practical purposes we should be allowed to make use of an opium in which the amount of morphine varies between 11·5 and 12·5 per cent., that of narcotine between 5·7 and 6·3 per cent., of codeine between 0·9 and 1·1 per cent., and of meconic acid between 4·7 and 5·3 per cent. By mixing 274 Gms. of opium A with 268 Gms. of opium B, 216 Gms. of opium C and 242 Gms. of opium D we shall have one kilogram of this opium.

If we only take into account the quantity of morphine in the opium above mentioned and we dilute the opium with sugar of milk or starch till we have the opium powder of the International Conference of 1902 we have four opiums each with 10 per cent. morphine but

	Narcotine. Per cent.	Codeine. Per cent.	Meconic Acid. Per cent.
A with	4·8	0·9	4·4
B with	3·4	0·5	3·2
C with	6·5	1·4	4·4
D with	6·1	0·7	5·2

I admit that "normal opium" based on four active principles would be improved if five or more active principles were introduced, but there are limits to everything. We do not possess methods for the standardization of the other active principles, and if we make an opium by mixing four opiums of different origin without the addition of an inactive drug, the chance that the opium will always have about the same activity is much greater than if we prepare a mixture of opium and sugar of milk or starch that contains 10 per cent. morphine.

It is not possible to determine the strength of opium by a physiological method as we do foxglove and strophanthus, for it causes no special reaction on any vital organ. We must be content

with a chemical method, but this must ensure us a drug that has approximately always the same therapeutic action. From this drug must be prepared our galenical preparations.

I thank you, Mr. President, for having given me an opportunity of bringing this subject under the notice of the British pharmacists, for nowhere better than in London, one of the marts of opium for Europe, can the amount of the different active principles be fixed for the "normal opium."

Discussion

The President, in inviting discussion, said he was sure he would be voicing the sentiments of all present when he congratulated Prof. van der Wielen on his command of our difficult English language.

Mr. E. F. Harrison welcomed the suggestions made by Prof. van der Wielen. The subject of the standardization of drugs for more than one active principle simultaneously was one in which he had long taken much interest, and he thought Prof. van der Wielen's paper indicated that whether it were nux vomica, opium, or other drug, the most practical way was to determine the amount of each active principle in each one of many parcels of the drug and then find by calculation what were the proportions in which they must be mixed to produce a drug of the required standard; in other words, bulking of considerable quantities would have to be practised. He was not quite sure that it was worth while standardizing opium according to the meconic acid as well as the alkaloids, but he was much in favour of standardizing it for morphine, narcotine, and codeine, and if possible for the total other alkaloids.

Mr. H. Wippell Gadd said he had listened with pleasure to the paper, for he was convinced that the proper way to estimate the value of opium was by taking into consideration the proportions of the various alkaloids present. Moreover, the standardization of meconic acid was probably also desirable, as it was always advisable to exhibit vegetable alkaloids as nearly as possible in the combination in which they naturally occurred. The professor's suggestions would cause much anxious labour to wholesale druggists; he did not complain of this, but would welcome further information from Prof. van der Wielen as to a practical method of carrying out his ideals.

Mr. R. A. Cripps remarked that Prof. van der Wielen had not

indicated specially any criticism of methods of assay, which was the point he would have liked to have spoken on. He thought the author was correct in his main point, namely, that they should aim not at the determination of one very active principle, but of the other principles which modified that action to a considerable extent. And, as Mr. Harrison pointed out, the natural corollary was that they must bulk in large quantities various parcels of a drug in order to attain to a standard preparation.

Mr. T. Maltby Clague said he was in favour of the inclusion of meconic acid, but at present he disputed the right of the narcotine to that position. He was sure Brady and Proctor would have disputed its right to be regarded as something which was for the good of the patient who would be taking it. It seemed to have a reputation as a convulsant rather than as a pure narcotic. It never had a full and proper right to the name which it enjoyed, and he doubted whether professors of physiology would agree in placing it among the desirable things to include in an opium product. He very much regretted the absence of Mr. Dott, who would have been able to speak more positively on that point.

Mr. N. H. Martin said that nearly fifty years ago Deane and Brady wrote a paper on "Opiates" in which they published a process for making tincture of opium one object of which was to eliminate the narcotine. That preparation was in great favour among medical men, and he believed it was made up by a large number of chemists under different names, and sold to medical men who used it. There must be some value in eliminating narcotine.

Mr. H. Finnemore wished to say a word as to the desirability of having the alkaloid united with meconic acid. There seemed to be an idea that because the alkaloid occurred naturally in the plant in combination with meconic acid that this was the best combination possible. That view he wished to express his strong dissent from. It might be better for the morphine to be so combined, but in the absence of evidence on the subject it was an open question.

Mr. F. W. Gamble said that the natural combination of the alkaloid was not assumed to be the best in the case of other drugs, why then of the opium alkaloids? The recent researches referred to in the paper showed that the addition of narcotine was an advantage, and the experience of medical men now seemed to coincide with this; there had lately been a considerable demand for the German brands of mixed alkaloids, and it was quite time

that the English alkaloid makers placed on the market an equivalent preparation.

THE PRESIDENT said that the outcome of the paper was to set the first problem for the Research Committee of the British Medical Association. It would be the wish of the meeting to accord to Prof. van der Wielen their hearty thanks for the interesting paper he had read and for his work in connection with British pharmacy.

THE MYRRH OF COMMERCE, ANCIENT AND MODERN

BY E. M. HOLMES, F.L.S., F.E.S.

Myrrh is one of the earliest drugs mentioned in history, and it might be supposed that after 3,000 years nothing new could be learnt concerning it. This, however, is by no means the case, as will be recognized at once from a perusal of the interesting details concerning the natural history of the tree in a new book on Somaliland published this year by Dr. R. E. Drake Brockman.

There are also some points in connection with the identity of the myrrh of ancient commerce that are not perhaps generally known. To these I propose to direct attention in the first place.

It has generally been taken for granted that the myrrh of Scripture is the medicinal myrrh. In my opinion this is not correct.

There has always been considerable difficulty in identifying the drugs used in ancient times, except in the very few cases where the name is still retained at the place of production. Myrrh is no exception to this rule. When the Bible was translated, the knowledge of botany was almost in its infancy. The Hebrew word Lôt, translated Myrrh in Genesis (xxxvii. 25 and xliii. 11), is a different Hebrew word to that employed in the Psalms, which is Môr. Evidently both were perfumes, since they are mentioned in conjunction with spices, whilst the myrrh of modern times has never been used either as a spice or as a perfume. The Hebrew word Lôt is now known to refer to Ladanum (Ladan in Arabic, Ledanon in Greek, and Ladanum in Latin), a fragrant, resinous exudation from *Cistus Creticus*, which is still used as a perfume.

The Hebrew word Môr used in the Psalms and Canticles is rightly translated myrrh, but is nevertheless not the myrrh known in Europe under that name, for the myrrh of Scripture was evidently a perfume. "All thy garments smell of myrrh,

aloes, and cassia" (Ps. xlv. 8), and in Canticles (iii. 6) "smoke perfumed with myrrh" is mentioned. The idea that the myrrh of Scripture was the medicinal myrrh of Europe probably arose from the ignorance of the translators and commentators that there are *two* kinds of myrrh recognised in the East, which are still, even at the present day, packed separately and sold separately, the second kind being known as perfumed myrrh in Bombay, and to the Arabs as "Bissabol," medicinal myrrh being called Heera Bol. In Somaliland, where both are produced, the medicinal myrrh is known as Mal-mal and the fragrant or perfumed myrrh as Habbak Hadi, i.e., the gum of the Hadi tree. These two products were evidently known to the Romans, since Pliny remarks that there is a kind of myrrh named "*Odoraria*" which is used in temples like incense.

This perfumed myrrh is the produce of *Commiphora erythræa*, var. *glabrescens*, Engl., is collected in the Ogaden country, south of Somaliland, and is sent from Somaliland ports, chiefly Berbera, to Bombay, and thence to China, where it is used in joss sticks, which are burnt like incense. Indeed, in all Chinese collections of drugs that I have seen the drug labelled myrrh is invariably the perfumed myrrh. Towards the end of the last century it occasionally reached England and Germany, and was purchased under the erroneous supposition that it was Opoponax, and the essential oil distilled from it formed the principal ingredient in the perfume of that name, and the oil is still sold as the Oil of Opoponax. It shows how little is known of some of the products of the East, that a perfumed variety of myrrh from Somaliland should be mistaken for a fœtid gum resin from Persia, where the opoponax is collected. That this perfumed myrrh or "bissabol" is evidently the myrrh of Scripture is obvious also from its use in the holy anointing oil (Exodus xxx. 34), which is spoken of as a perfume (v. 37). The bark of the tree is still used by the Somali women to fumigate and perfume their huts. Fumigation is a favourite form of perfuming apartments in the East, and the Kyphi of the ancient Egyptians have their modern representative in the fumigating pastilles of the present day.

The Myrrh of Modern Commerce

The medicinal myrrh, the produce of *Commiphora Myrrha*, Holmes, *Journ. Bot.*, July 1913, is well known to be frequently mixed with other resins, which are generally picked out in the

wholesale trade and sold as bdellium. The watery emulsion produced when it is rubbed with water leaves a glossy surface, and it has been supposed that bdellium was thus used by the artists of the Middle Ages, to give a glossy surface to pictures and frescoes.

The trees that yield the medicinal myrrh, and the various kinds of bdellium mixed with it, have hitherto been very imperfectly known. Owing to the thorny character of the trees, and the small clustered leaves in several species, herbarium specimens are very difficult to press, and as the flowers appear in the hottest time of the year, when the weather is too hot, as a rule, for Europeans, are, therefore, rarely collected, so that the trees have until now remained imperfectly known.

Although very little progress has been made in our knowledge of the trees that yield myrrh on the Arabian coast, the publication of Dr. E. Drake Brockman's work on Somaliland adds considerably to our knowledge of the trees yielding myrrh and the gum resins sometimes found mixed with it in that country.

In *Pharmacographia*, published in 1874, it is stated by Mr. D. Hanbury that the Somalis call myrrh "Mul-mul," and the myrrh tree "Didthin," and that they consider the Arabian tree identical with that of Somaliland, also that Hildebrandt ascertained that it was identical with the *Balsamodendron Myrrha* of Nees. In 1893, however, Dr. Schweinfurth stated that myrrh was produced by *Commiphora Abyssinica*, Engl., and *C. Schimperi*, Engl., and in 1896 the then Director of Kew Gardens published in the *Kew Bulletin* (1896, p. 91) the opinion that the variety *simplicifolia* of the latter species may be accepted as the source of Yemen myrrh, and that Fadhli myrrh of Arabia may be produced by both *C. Myrrha* and *C. Schimperi*, variety *simplicifolia*. In January, 1899, I pointed out in *The Pharmaceutical Journal* that myrrh could not possibly be derived either from *C. Abyssinica* or *C. Schimperi*, nor from *Commiphora Myrrha*, Engl., but that it undoubtedly was the produce of the tree called by Nees, *Balsamodendron Myrrha*. Nevertheless, in 1906 Drs. Tschirch and Bergmann expressed the opinion that *C. Schimperi* and *C. Abyssinica* yield Arabian myrrh, and possibly also part of the Somaliland myrrh, and that the myrrh from N.E. Africa is produced by *C. Playfairii*, Hook., which they considered to be identical with Engler's *C. Myrrha*, var. Mol-Mol. This, however, is an error, for *C. Playfairii* is really a quite different species, and yields gum Hotai.

The actual verification of the Somali myrrh I owe to the kindness of Mr. and Mrs. Lort Phillips, who kindly brought me specimens of leafy twigs of the tree with fruits, as well as bark off the same tree as the twigs. They also ascertained that the Somali name of the tree was Didthin, and that of myrrh, Mal-Mal, thus confirming previous statements to the same effect by Lieutenant Wykeham Perry, and the German traveller Hildebrandt. To this information Dr. Drake Brockman has added that the Somalis distinguish two kinds of myrrh, viz. :—

(1) Guban myrrh, obtained from the torrid, low-lying, hilly plains extending inland as far as the higher mountain ranges.

(2) Ogo myrrh, collected on the mountain ranges of the interior, including the Haud, Nogal Valley, and Ogaden.

Since the publication of his book, Dr. Drake Brockman tells me that he finds that the Somalis differentiate two kinds of myrrh trees on the maritime plain, one of which they call "Didthin ad" (white) and the other "Didthin madow" (black), the leaves in the one, as represented in specimens sent to Kew, being narrower, and slightly toothed and pale green and in the other broader, nearly entire, and of a dull, deeper green colour. So far as he has been able to observe, there seems to be little, if any, difference in the myrrh they yield.

The Didthin tree, which produces the Guban Mal-mal, never grows to the same size as it does in Ogaden, seldom exceeding a height of 4 ft. or 5 ft., and is usually to be found on stony rises or hills. The gum is collected during the hot summer months, when the tree is in a leafless condition. The flowers are the first to appear, and are rapidly followed by the leaves in August or early September; the seeds are ripe in January.

The tree yielding Ogo Mal-mal is, according to the Somalis, identical with the Didthin, but grows to a greater size, and the superiority of the Ogo myrrh is due to the fact that it is the produce of much finer trees.

The Ogo tree attains about 15 ft. in height, and spreads its branches over a diameter of 20 ft. or more, the trunk being quite 1 ft. in diameter.

It is not so frequently seen as the Guban tree. Dr. Brockman describes the bark of the trunk of the Didthin as usually rough, thick, and gnarled on the old trees, while that on the young trees and the branches of the older ones, is smooth, and on undergoing exfoliation exposes the smooth green bark underneath, and the underground portion of the stem is of a deep bronze-maroon or

black colour. The thorns and smaller branches are usually of an ashy or French grey colour, and only covered with foliage for a short time following the rainy season. It requires little soil or water for its existence. The flowers seldom exceed 10 mm. in length, and hang separately, from the young shoots, as do the leaves, either in sessile bunches or longer, slightly stalked leaves, armed with two minute leaflets. The leaves are never trifoliate. The main root-stem, which is not unlike a cherry-wood stick, is sometimes chewed to allay thirst; it is slightly sweet, and the wood soft for the teeth, but contains very little gum. On some of the trees, especially the dwarf ones, the leaves are either all roughly serrated round the edges or are quite rounded.

The Ogo myrrh has a much drier and more friable appearance on the surface when freshly gathered, and after it has travelled to the coast and the pieces been well rubbed together in transit, they present a rough surface, the interstices being filled with a pale yellow powder.

The Guban variety never gets the powdery appearance, but is always of a bright treacle-red colour owing to its more oily consistency, and seems to be composed of numberless rounded tears or drops, varying in size from a pin's head to a pea, giving the whole mass a very irregular shape. It is distinctly less bitter than the Ogo variety. If the whitish scrapings are placed on absorbent paper a large grease spot rapidly forms round it, but a quite insignificant spot is left by the Ogo Mal-mal.

According to Dr. R. E. Drake Brockman, the best myrrh that reaches the coast towns of British Somaliland comes from the far interior, the Dulbahanta and Ogaden countries, and is invariably packed in goatskin bags.

The Somalis adopt no particular method of collecting the various gums, which are allowed to exude and fall to the ground. Leading the nomadic life, the old women and children add to their stock by degrees, and pack the resin in goatskin bags, only bringing them down to the coast when well filled.

The Arabian and Indian traders call it "Murr." The Habbak hadi or perfumed myrrh, is brought down by the Ogaden caravans, packed in separate goatskins, and is never mixed with true myrrh. It is sometimes given medicinally to milch camels to improve their condition.

The President said that this was one of the researches into

ancient history brought up to date that they were accustomed to receive from Mr. Holmes. Their thanks were due to him for his efforts. He did not forget that Mr. Holmes was their President when they had last met in London, and they were all glad to have him with them again looking hearty and well.

CHEMICAL EXAMINATION OF WHEAT GERM.[1]

By Dr. Frederick B. Power and Dr. Arthur H. Salway.

The material known as wheat germ was formerly a waste product of the flour mills, or used only as fodder, but in recent years it has been utilized for its dietetic value as a constituent of certain kinds of bread, and in various other forms for food purposes. In distinction from ordinary wheat flour, the germ of wheat appears to be particularly characterized by its high percentage of fat and high nitrogen content.

The present investigation of wheat germ was not undertaken primarily for its inherent interest, but was the indirect sequence of some other researches for which a considerable quantity of the respective material was required. In the first place, it may be recalled that a number of compounds which have been isolated from plants during the past few years in these laboratories, and were regarded as dihydric alcohols, such as ipuranol, citrullol, trifolianol, ipurganol, bryonol, etc., have recently been shown by the authors to consist of phytosterol glucosides (*J. Chem. Soc.*, 1913, **103,** 399). As such glucosides, now collectively designated as phytosterolins, represented a new class of compounds, which had previously not been known to occur in nature, it was deemed desirable to effect their synthesis. For this purpose a considerable quantity of a definite phytosterol was required, and the best source of such a substance was evidently the so-called wheat germ, which is known to contain a comparatively large proportion of sitosterol, $C_{27}H_{46}O$. This compound was, in fact, first isolated from the fatty oil of wheat germ by Burian (*Monatsh.*, 1897, **18**, 551), and completely characterized by him. The synthetical preparation of a sitosterol-*d*-glucoside, $C_{33}H_{56}O_6$, has now been accomplished by one of the present authors (compare Salway, *J. Chem. Soc.*, 1913, **103,**

[1] Communication from the Wellcome Chemical Research Laboratories.

1022), and has been found to agree in its characters with the naturally occurring compound which was first designated as ipuranol.

Apart from the isolation of sitosterol, the wheat germ has previously been the subject of several independent investigations, the results of which, however, as recorded in the literature, are quite discomected. As a considerable quantity of material was available for the purpose mentioned, it seemed desirable that the opportunity should be utilized for subjecting it to a more complete and systematic examination. In connection therewith consideration has been taken, so far as possible, of the present state of knowledge on the subject.

Under the title of "wheat oil," as distinguished from "wheat meal oil," or the oil from wheat flour, Lewkowitsch (*Chemical Technology and Analysis of Oils, Fats, and Waxes*, third edition, Vol. II., p. 520) has recorded the physical and chemical constants of the oil from wheat germ and of the mixed fatty acids obtained therefrom (compare also Frankforter and Harding, *J. Amer. Chem. Soc.*, 1899, **9,** 758).

Richardson and Crampton (*Ber.*, 1886, **19,** 1180) found the wheat germ to contain, besides fatty oil, about 15 to 18 per cent. of sugar. The latter, although consisting chiefly of cane sugar, was observed to be accompanied by another form of sugar, which possessed a high dextrorotatory power, and was not fermentable. This was presumed to be raffinose, although they did not succeed in separating it. The same authors also isolated allantoin, and noted the presence of "a wax-like, unsaponifiable fat," as also of several albuminous substances.

Schulze and Frankfurt (*Ber.*, 1893, **26,** 2151) have conclusively shown the presence of both choline and betaine in wheat germ, the yield of betaine chloride having been about 0·16 to 0·2 per cent., while that of choline chloride was considerably less. The same authors (*Ber.*, 1894, **27,** 64) subsequently established the presence of raffinose.

Frankfurt (*J. Chem. Soc. Abst.*, 1897, **72,** ii., 67), in a summary of the constituents of wheat germ, has also indicated, in addition to the above-mentioned compounds, the occurrence of asparagine, lecithin, glucose, and a ferment which vigorously inverts cane sugar.

Experimental

The material employed for this investigation consisted of a

good quality of wheat germ, which was obtained directly from one of the large flour mills near London.

A small portion (10 Gm.) of the material was first subjected to a preliminary test for an alkaloid by extraction with Prollius' fluid. The reactions obtained with the usual alkaloid reagents were, however, very slight.

Another portion (25 Gm.) of the material was extracted in a Soxhlet apparatus with various solvents, when the following amounts of extract, dried at 100°, were obtained :

Petroleum (b.p. 35–50°)	extracted	2·08	Gm	=	8·32 per cent.
Ether	,,	0·14	,,	=	0·56 ,, ,,
Chloroform	,,	0·31	,,	=	1·24 ,, ,,
Ethyl Acetate	,,	0·19	,,	=	0·76 ,, ,,
Alcohol	,,	6·20	,,	=	24·80 ,, ,,
	Total	8·92	Gm.	=	35·68 per cent.

For the purpose of a complete examination 50·8 kilogrammes of the wheat germ were extracted by continuous percolation with hot alcohol. After the removal of the greater portion of the alcohol, 22·75 kilogrammes of a light brown, viscid extract were obtained. The whole of this extract, in convenient portions, was mixed with water, and the mixture distilled in a current of steam, but it yielded no appreciable amount of volatile oil. After this treatment the distillation flask contained an aqueous liquid and a considerable quantity of a fatty oil, together with a small quantity of resinous material, the whole forming a thick emulsion, which did not separate on keeping. A separation was effected, however, by agitating the mixture with hot amyl alcohol, which dissolved the fatty oil, while the resinous material remained suspended in the aqueous liquid. The aqueous liquid was then filtered and the resin collected, when, after being washed and dried, it amounted to 22 Gm. This resinous material was separately examined, but no definite substance could be isolated from it.

Examination of the Aqueous Liquid

The aqueous liquid from which the fatty oil and resin had been separated, as above described, was extracted many times with ether. This solvent removed about 3 Gm. of viscid, fatty material, which was evidently similar in character to the main portion of fatty oil.

The aqueous liquid was next shaken repeatedly with hot amyl

alcohol. The amyl alcohol liquids were then united, washed with a little water, and the solvent removed by distillation under diminished pressure, when a quantity (10 Gm.) of a dark brown syrup was obtained. This was dissolved in alcohol and the solution kept for some time, when a small quantity of a crystalline solid separated. The latter was collected and dissolved in hot dilute alcohol, from which it was deposited in slender, colourless needles, melting and decomposing at about 240°. The same compound was subsequently isolated in larger amount from the aqueous liquid, as described below, and was then completely identified as allantoin.

The alcoholic liquid from which the small amount of allantoin had first separated, as above noted, was evaporated, and the residue divided into two portions. One portion was heated for some time with dilute sulphuric acid, when a small amount of a sugar was formed, which yielded an osazone melting at 210°, but no other definite hydrolytic product was obtained. It was thus evident, however, that the material was glucosidic in character.

Isolation of Sinapic Acid, $C_{11}H_{12}O_5$

(4-Hydroxy-3 : 5-dimethoxycinnamic Acid)
$C_6H_2OH{\cdot}(OCH_3)_2{\cdot}\,CH : CH{\cdot}CO_2H$.

The remaining portion of the residue from the above-mentioned alcoholic liquid was heated for a few minutes with an excess of aqueous potassium hydroxide, the mixture then acidified with dilute sulphuric acid and subsequently extracted with ether. After washing and drying the ethereal liquid, the solvent was removed, when about 0·5 Gm. of a brown, crystalline solid remained. This was re-dissolved in ether, the solution shaken with aqueous ammonium carbonate, and the alkaline liquid acidified and extracted with ether, when a crystalline substance was obtained, which melted and decomposed at about 186°. After recrystallization from dilute alcohol, it separated in nearly colourless needles, which melted and decomposed at 190–192°. The substance was freely soluble in alcohol, but only moderately soluble in water. In alcoholic solution it gave with ferric chloride a deep red colour, whilst in aqueous solution with the same reagent a red precipitate was produced. The substance was analysed, and titrated with a decinormal solution of sodium hydroxide, with the following results :—

0·0958 gave 0·2068 CO_2 and 0·0458 H_2O. C=58·9 ; H=5·3.
0·1091 required for neutralization 5·05 C.c. $N/_{10}$ NaOH.
M.W. (for a monobasic acid)=216
$C_{11}H_{12}O_5$ requires C=58·9 ; H=5·4 per cent. M.W.=224.

It is evident from these results and from the properties of the above-described compound that the latter is identical with sinapic acid (compare Gadamer, *Arch. Pharm.*, 1897, **235**, 92, 570). In order to confirm its identity it was converted by methylation into 3 : 4 : 5-trimethoxycinnamic acid, $C_6H_2(OCH_3)_3{\cdot}CH : CH{\cdot}CO_2H$, which has been shown by Gadamer (*loc. cit.*, p. 110) to melt at 123–124°. This was accomplished by dissolving the substance in an excess of aqueous potassium hydroxide, and warming the solution with methyl sulphate, after which the mixture was acidified and extracted with ether. The ethereal liquid, on evaporation, yielded a crystalline acid which melted at 123–124°, and was identical in its properties with trimethoxycinnamic acid.

The isolation of sinapic acid as a product of alkaline hydrolysis indicates that it was originally present in some form of combination. Inasmuch as it has been shown that the sinapine contained in black mustard seed consists of a choline ester of sinapic acid (*Arch. Pharm.*, 1897, **235**, 101), and as choline is also a constituent of wheat germ, it seems highly probable that the sinapic acid obtained from the latter source was orginally present as sinapine.

Isolation of Raffinose, $C_{18}H_{32}O_{16}$, $5H_2O$

The original aqueous liquid which had been extracted with amyl alcohol, as described above, was set aside for a considerable time, when a quantity of a colourless, crystalline solid slowly separated. This was collected, and re-crystallized from very dilute alcohol, when it separated in slender, elongated needles, containing water of crystallization. The air-dried substance was found to melt at 85°, whilst the anhydrous solid melted at 135–140°. The substance was analysed, and its optical rotatory power determined, with the following results :

0·4645 air-dried substance, heated at 100°, lost 0·0682 H_2O.
H_2O = 14·7
0·1116 anhydrous substance gave 0·1745 CO_2 and 0·0648 H_2O.
C = 42·6 ; H = 6·5
$C_{18}H_{32}O_{16}$, $5H_2O$ requires H_2O = 15·2 per cent.
$C_{18}H_{32}O_{16}$ requires C = 42·9 ; H = 6·3 per cent.

1·9854 anhydrous substance, made up to 20 c.c. with distilled water, gave α_D +23°30′ in a 2-dcm. tube, whence $[\alpha]_D$ +118·4°.

These results indicated the above described substance to be raffinose, which had previously been obtained from wheat germ by Schulze and Frankfurt (*Ber.*, 1894, **27,** 64). It has, however, been recorded in the literature that raffinose, in the anhydrous state, melts at 118–119°, and in a 10 per cent. solution has a specific optical rotation of +104·4°. The somewhat higher melting point and rotatory power observed in the present instance are doubtless to be attributed to a greater degree of purity of the substance, since the raffinose obtained by previous investigators might easily have been contaminated with a little cane sugar.

After the extraction of the original aqueous liquid with amyl alcohol and the separation of the raffinose, as described above, it was treated with a solution of basic lead acetate, when a comparatively small amount of a pale yellow precipitate was produced. This was collected, washed with water, and then suspended in water and decomposed by hydrogen sulphide. The mixture was subsequently filtered, and the filtered liquid concentrated under diminished pressure to a thin syrup. It gave a reddish-brown coloration with ferric chloride, but no precipitate with gelatin, and therefore contained no tannin. As nothing separated from the liquid on keeping for some time, it was heated for a few minutes with aqueous potassium hydroxide, after which it was acidified with sulphuric acid and extracted with ether. The ethereal liquid yielded only a further small amount of the previously described sinapic acid (m.p. 190–192°).

Isolation of Cane Sugar, $C_{12}H_{22}O_{11}$

The filtrate from the above-mentioned basic lead acetate precipitate, after treatment with hydrogen sulphide for the removal of the excess of lead, was concentrated under diminished pressure to the consistency of a syrup. The latter contained a considerable quantity of a reducing sugar, since it readily yielded *d*-phenylglucosazone (m.p. 210°). As it was observed many years ago by Richardson and Crampton (*Ber.*, 1886, **19,** 1180) that the sugar of wheat germ consists to a large extent of cane sugar, it was deemed desirable also to ascertain the presence of the latter in the material under examination. A portion of the syrup was therefore digested with hot alcohol, the alcoholic liquid decanted while still hot, and a little ethyl acetate added until a

slight cloudiness appeared. On keeping this mixture for some time, colourless, prismatic crystals were deposited, which melted at 184°. An analysis and a determination of the optical rotatory power of this substance gave the following results :

0·1264 gave 0·1950 CO_2 and 0·0745 H_2O. C = 42·1 ; H = 6·5.
$C_{12}H_{22}O_{11}$ requires C = 42·1 ; H = 6·4 per cent.
0·8560, made up to 20 c.c. with distilled water, gave α_D + 5° 39′ in a 2-dcm. tube, whence $[\alpha]_D$ +66.0°.

These results proved the identity of the substance with cane sugar.

Isolation of Allantoin, $C_4H_6O_3N_4$

The occurrence of allantoin in wheat germ was recorded several years ago by Richardson and Crampton (*Ber.*, 1886, **19,** 1180), who found the amount present to be somewhat less than 0·5 per cent, of the weight of the germ. It was also noted by those investigators that allantoin had only once previously been found in plants, but it is now known to be quite widely distributed in the vegetable kingdom (compare *P.J.*, 1913, **90,** 550).

In order to confirm the presence of allantoin in the material under examination, a portion of the above-mentioned syrupy liquid was employed, which had been purified by means of basic lead acetate. To this liquid an aqueous solution of mercuric nitrate was added until no further precipitate was produced, the precipitate being then collected, washed with water, and subsequently suspended in water and decomposed by hydrogen sulphide. The mixture was then filtered, and the filtrate, after removing the excess of hydrogen sulphide, exactly neutralized with ammonia, after which it was evaporated to a small volume under diminished pressure. On keeping the liquid for some time, it deposited colourless, rhombohedral prisms, which decomposed at about 238°. This substance possessed all the characters of allantoin, and its identity was confirmed by an analysis.

0·1477 gave 0·1654 CO_2 and 0·0514 H_2O. C = 30·5 ; H = 3·9.
$C_4H_6O_3N_4$ requires C = 30 4 ; H = 3·8 per cent.

Isolation of Betaine, $C_5H_{11}O_2N$, and Choline, $C_5H_{15}O_2N$

Although the occurrence of both betaine and choline in wheat germ had been definitely established by Schulze and Frankfurt (*Ber.*, 1893, **26,** 2151), it was deemed desirable, for the sake of completeness, to confirm their presence in the material under

investigation. For this purpose a portion of the syrupy liquid was employed which had been purified by means of basic lead acetate, as already described. To this liquid an aqueous solution of phosphotungstic acid was added, when a voluminous precipitate was produced, which was collected, and washed with water. The precipitate was then intimately mixed, in the cold, with aqueous barium hydroxide, the mixture filtered, and the excess of baryta removed from the filtrate by means of carbon dioxide. After being again filtered, the liquid was rendered faintly acid by the addition of a little hydrochloric acid, and then concentrated under diminished pressure to the consistency of a syrup. The latter was digested with hot alcohol, and to the filtered liquid an alcoholic solution of mercuric chloride was added. On keeping the mixture for several days, a crystalline double mercuric salt separated, which was collected, dissolved in hot water, and decomposed by hydrogen sulphide. The filtrate from the mercuric sulphide was concentrated under diminished pressure, when a residue was obtained which quickly crystallized. This product was treated with cold absolute alcohol, when a portion, which was very sparingly soluble in the latter liquid, remained undissolved. The concentrated aqueous solution of this sparingly soluble salt, on the addition of gold chloride, yielded an aurichloride which slowly separated in glistening laminæ, and was analysed.

0·1287 gave on ignition 0·0555 Au. Au = 43·1.
$C_5H_{12}O_2N.AuCl_4$ requires Au = 43·2 per cent.

The presence of betaine in wheat germ was thus confirmed.

The portion of the above-mentioned crystalline product which was readily soluble in alcohol was recovered by the evaporation of the solvent, and the residue again treated with cold absolute alcohol. This alcoholic liquid, on the addition of a solution of platinic chloride, yielded a platinichloride, which was analysed.

0·0915, dried at 110°, gave on ignition 0·0287 Pt. Pt = 31·4.
$(C_5H_{14}ON)_2\ PtCl_6$ requires Pt = 31·7 per cent.

This result afforded confirmation of the presence of choline.

Examination of the Fatty Oil.

As previously noted, the mixture resulting from the distillation of the original alcoholic extract with steam was shaken with hot amyl alcohol in order to effect the separation of the fatty oil. The latter, after the removal of the solvent, amounted to 3600

Gm., which is equivalent to about 7 per cent. of the weight of wheat germ employed.

Isolation of Sitosterol, $C_{27}H_{46}O$

A portion (300 Gm.) of the fatty oil was hydrolysed by heating with an alcoholic solution of potassium hydroxide, after which the greater part of the alcohol was removed, water added, and the alkaline liquid repeatedly extracted with ether. The pale yellow, ethereal liquid was washed, dried, and the ether removed, when 20 Gm. of a crystalline residue were obtained. On dissolving the latter in hot ethyl acetate, it yielded 11 Gm. of a pure crystalline substance, which separated in colourless needles, melting at 138°. An analysis and a determination of its optical rotatory power gave the following results :

0·6198 of air-dried substance, on heating at 110°, lost 0·0306 H_2O ;

$$H_2O = 4{\cdot}9.$$

0·1115 of anhydrous substance gave 0·3428 CO_2 and 0·1190 H_2O.

$$C = 83{\cdot}8 \; ; \; H = 11{\cdot}9.$$

$C_{27}H_{46}O$, H_2O requires $H_2O = 4{\cdot}5$ per cent.

$C_{27}H_{46}O$ requires $C = 83{\cdot}9$; $H = 11{\cdot}9$ per cent.

0·5892 of anhydrous substance, made up to 20 c.c. with chloroform, gave $[\alpha]_D$ — 1°54′ in a 2-dcm. tube, whence $[\alpha]_D$ −32·2°.

The above-described substance was thus shown to consist of pure sitosterol. The amount obtained from 300 Gm. of the fatty oil indicates that sitosterol is contained in the wheat germ to the extent of about 0·26 per cent.

The ethyl acetate mother-liquor remaining after the removal of the sitosterol had a deep yellow colour, and contained a considerable amount of uncrystallizable material. The solvent was therefore removed, and the residue distilled under diminished pressure, when two fractions were collected, which passed over at 80 to 250°/20 mm. and above 250°/20 mm. respectively. The first fraction was a limpid, yellow oil, which possessed a strong, somewhat aromatic odour, but did not yield the characteristic phytosterol reaction. When dissolved in chloroform with a little acetic anhydride, and a drop of concentrated sulphuric acid subsequently added, only a brown coloration was produced. The fraction boiling above 250°/20 mm. yielded a little sitosterol, melting at 138°.

Identification of the Fatty Acids

The alkaline liquid resulting from the hydrolysis of the fatty

oil, which had been extracted with ether for the removal of the sitosterol, as described above, was next acidified with sulphuric acid, and again extracted with ether. This ethereal solution was washed, dried, and the ether removed, when about 230 Gm. of fatty acid were obtained. As the product evidently consisted of a mixture of saturated and unsaturated acids, it was first separated into solid and liquid portions by means of the lead salts and treatment of the latter with ether.

The Solid Acids.—The portion of the lead salt which was insoluble in ether, when decomposed by hydrochloric acid, yielded 50 Gm. of solid acid. For the examination of the latter, it was converted into the methyl ester, which was then distilled under diminished pressure. Although the entire amount passed over at 193–195°/15 mm., it was collected in three portions, which, however, were found to be identical in character. They all formed colourless solids, melting at 29–30°, and having a saponification value of 205°, while each of them yielded a fatty acid melting at 63–64°. The middle portion of the methyl esters was analysed.

0·1190 gave 0·3312 CO_2 and 0·1350 H_2O. C = 75·9 ; H = 12·6.
$C_{15}H_{31}\cdot CO_2CH_3$ requires C = 75·6 ; H = 12·6 per cent. S. V. = 208.
$C_{17}H_{35}\cdot CO_2CH_3$ requires C = 76·5 ; H = 12·8 per cent. S.V. = 188.

It is evident from these results that the solid acids consisted entirely of a mixture of palmitic and stearic acids, and apparently in about equal proportions.

The Liquid Acids.—The portion of lead salt which was soluble in ether, when decomposed by hydrochloric acid, yielded about 150 Gm. of liquid acid. When distilled under diminished pressure, practically all of this product passed over at 245°/25 mm. as a pale yellow oil. This was analysed, and its neutralization and iodine values determined, with the following results :—

0·1218 gave 0·3444 CO_2 and 0·1284 H_2O. C = 77·1 ; H = 11·7.
0·2297 required 8·1 c.c. $N/_{10}KOH$ for neutralization. N.V. = 198.
0·1302 absorbed 0·2181 Iodine. Iodine value = 167.
$C_{18}H_{32}O_2$ requires C = 77·1 ; H = 11·4 per cent.
Neutralization value = 200·4 ; Iodine value = 181·3.

These results indicate that the liquid acid consisted of practically pure linolic acid.

SUMMARY

The so-called wheat germ, as already noted, is the best known

source of the typical phytosterol which has been designated sitosterol. As a considerable quantity of this compound was required for the purpose of the synthetical preparation of its glucoside (Salway, *J. Chem. Soc.*, 1913, **103,** 1022), it was deemed desirable, incidentally, to subject the wheat germ to a complete chemical examination. The amount of wheat germ thus employed was 50·8 kilogrammes.

In addition to the above-mentioned sitosterol, it has been shown by previous investigators that wheat germ contains the following substances: Choline, betaine, allantoin, cane sugar, dextrose, and raffinose. In the course of the present investigation the occurrence of all these substances has been confirmed, but no evidence was obtained of the presence of asparagine, which has been recorded by Frankfurt (*J. Chem. Soc. Abst.*, 1897, **72,** ii. 67) as a constituent of wheat germ.

The amount of fatty oil obtained in the present instance, which was separated from an alcoholic extract of the wheat germ, was equivalent to about 7 per cent. of the weight of material employed. The physical and chemical constants of this oil, as obtained by a more direct process of extraction, and also of the mixed fatty acids therefrom, have previously been recorded (compare Lewkowitsch, *Chemical Technology and Analysis of Oils, Fats, and Waxes*, third edition, Vol. II., p. 520). So far as known to us, the nature of the fatty acids, which are chiefly contained in the oil as glycerides, has, however, not hitherto been determined. These have now been found to consist of palmitic, stearic, and linolic acids, the amount of the latter being about three times as much as that of the total solid acids. The amount of resinous material contained in the wheat germ is exceedingly small, representing only about 0·04 per cent. of its weight. A small amount of amorphous glucosidic material was also obtained.

It has now been ascertained that wheat germ contains a very small amount of sinapic acid, $C_{11}H_{12}O_5$, which is present in some form of combination. This fact is of special interest, inasmuch as the respective acid has hitherto only been known to occur in mustard seed, or at least in the family of *Cruciferæ*. As it exists in black mustard seed in the form of sinapine, which is a choline ester of sinapic acid, it is highly probable that the latter occurs in the same form of combination in wheat germ.

THE STRUCTURE OF THE SOYA BEAN.

By T. E. Wallis, B.Sc., F.I.C.

The majority of the beans are of a pale yellow colour; they average 8 mm. in length, 7 mm. in breadth, and 6 mm. in thickness, so that they are roundly ovoid in shape. The hilum is about 3 to 4 mm. long, and is found in the middle of one of the longer edges of the bean. When soaked in water the beans expand unevenly, so that after soaking they are more kidney-shaped. The average dimensions of soaked beans are: Length, 13·28 mm.; breadth, 8·42 mm.; and thickness, 6·5 mm., showing an increase of 65 per cent. in length and of 17 and 3·3 per cent. in breadth and thickness respectively. During the process the

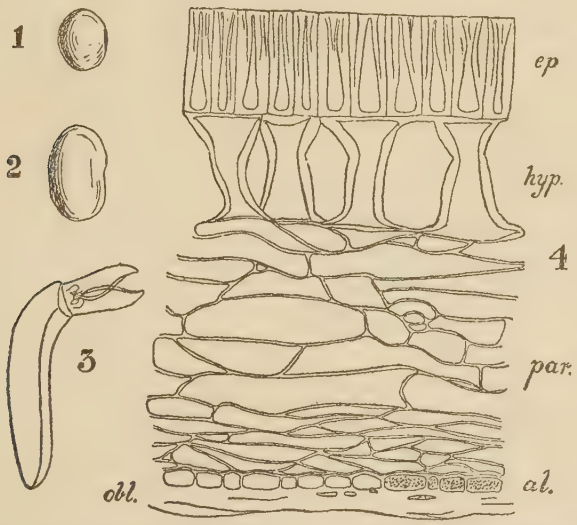


Fig. I.—1. Unsoaked Soya Bean, xl; 2. Bean after soaking in water, xl; 3. Radicle and plumule removed from a bean, x5; 4. Transverse section of seed-coat, *ep.* epidermis; *hyp.* hypoderma composed of "bearer-cells"; *par.* parenchyma; *al.* aleurone layer; *obl.* collapsed parenchyma x300.

beans take up more than 1·25 times their own weight of water—*e.g.*, 48 seeds weighing 6·967 Gm. absorbed 8·765 Gm., or 125·8 per cent of water. In a quarter of a pound of beans containing about 782 seeds (calculated from the weight of 48 seeds) there were 4 black seeds and 5 brown ones, the remainder, about 99 per cent., were all yellow. These dark-coloured beans are of a

smaller average size (measuring 7·5 by 5·5 by 4 mm.), and show a more elongated form than the commoner yellow beans.

Structure of the Seed-Coat.—A transverse section of the testa, taken from the middle of the side of a bean, shows an epidermis composed of closely packed cells oblong in outline with the long axis at right angles to the outer surface; the length of each cell is about 45·5μ and the breadth 14μ. The walls are cellulose and much thickened with longitudinal pits at the upper ends; the lumen is small and enlarged at the base. Under the epidermis is a single row of "bearer cells" of the usual hour-glass or capstan shape. They have thick walls and are in contact with one another only at the top and the base; they vary in length from 40 to 120μ, the longest cells being found near the hilum, and in breadth from 30 to 40μ at top and bottom and from 20 to 35μ at the middle. There follow next several rows of thin-walled cellulose parenchyma, the cells of which are elongated tangentially and the inner rows are much crushed; the total width of this layer is about 122μ. Immediately within this parenchyma is a well-marked single layer of rectangular cells containing small rounded aleurone grains which stained readily with iodine, but gave no reaction with Millon's reagent. The lumen of each cell is 15 to 25μ long and 10μ in width. A wide hyaline band of about 10μ in thickness is found on the inner side of the aleurone layer. It is composed of collapsed cells and shows here and there traces of the compressed luminae.

At the hilum, as is usual in seeds of this natural order, the epidermis is doubled and is also split longitudinally. Underneath the opening is the group of tracheids which form a prolongation of the raphe, with which they are continuous. The hilum is covered by the thin papery remains of the funicle. The cells of the upper epidermal layer in this region are rather smaller than the other epidermal cells, and are not pitted in the same way; the difference is best seen in surface preparations. The "bearer-cells" also are not present, and are replaced by thick-walled and deeply pitted cells (30 to 50μ in either direction), forming a sclerenchyma which varies in thickness from one cell next to the group of tracheids to eight or nine cells beneath the raised edge of the hilum; the width of the band then rapidly diminishes, and is finally replaced by the ordinary bearer-cells. The parenchyma below this is also modified, and consists of rounded cells having thick walls and joined to one another by projections, thus forming a loose tissue containing numerous intercellular

spaces; this tissue also has an area equal to that of the hilum. The inner cells of this tissue stain red with phloroglucin and hydrochloric acid, as also do the tracheids, showing that they are lignified; all other cell walls are composed of cellulose.

The group of tracheids is about 0·35 mm. deep, 0·15 mm. wide and 2·8 mm. long and is surrounded by three or four rows of thin-walled cellulose parenchyma. The tracheids themselves are 60

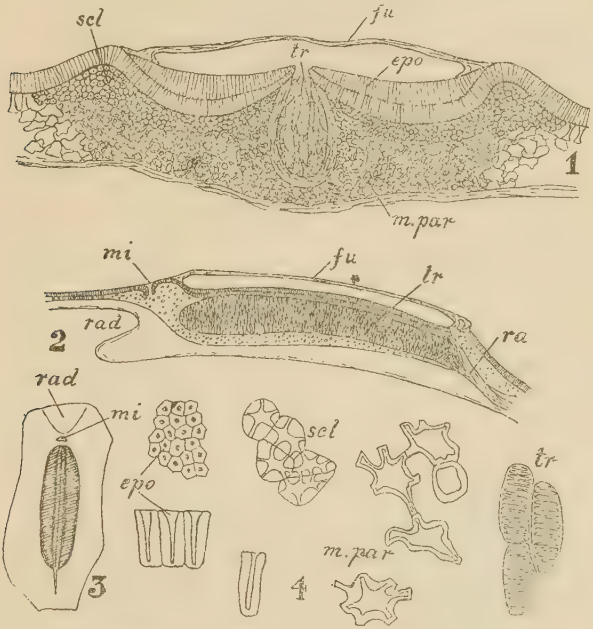


Fig. II.—1. Transverse section through the hilum furrow, x40; 2. Longitudinal section of the same, x15; 3. Surface view of hilum, x3·75; 4. Isolated cells from region of the hilum, x150; *fu.* remains of the funiculus; *scl.* sclerenchyma; *epo.* upper layer of epidermis; *m. par.* modified parenchyma; *tr.* tracheids; *mi.* micropyle; *ra.* raphe; *rad.* pocket for radicle.

to 85μ long and 30μ wide; and they are pitted by long transverse pits giving them a scalariform appearance.

Surface Preparations.—If the seed-coat is removed and soaked for a few hours in caustic soda solution, it can be easily teased up with needles and the different layers separated. The *epidermis* consists of small polygonal cells 15 to 20 in either direction. The line of separation between neighbouring cells is

only faintly visible. Seen from above, they show an irregular slit-shaped lumen with numerous pits; from below, the lumen is larger and no pits are visible. Isolated cells show that the pits extend about half the length of the cells and the potash

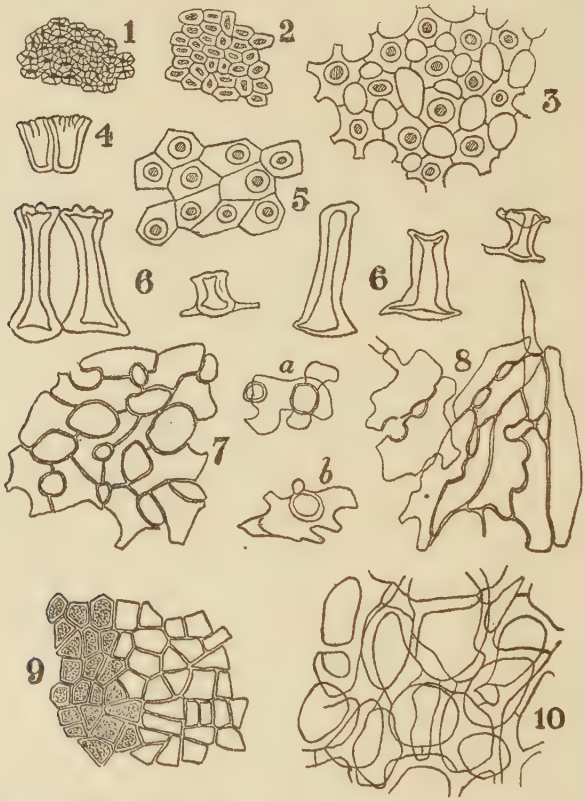


Fig. III.—Surface preparations from the seed coat, isolated by caustic soda solution. All x150. 1. Epidermis from above; 2. Epidermis from below; 3. Hypoderma from below; 4. Two epidermal cells; 5. Hypoderma from above; 6. Isolated bearer-cells; 7, 8, 10. Cells of the parenchyma proceeding from the outside to the inside; *a*, an isolated cell from 7; *b*, an isolated cell from 8; 9. aleurone layer, aleurone grains are shown in a few of the cells.

swells the wall, causing the cells to open out slightly like a fan in the upper part. The cells of the upper epidermal layer from the hilum are polygonal and 10 to 15μ in diameter; they show no pits, and the lumen appears as a central dot. *The "bearer"*

cells seen from above form a continuous layer with no intercellular spaces; the cells are polygonal (30 to 50μ in diameter), and show a double circle in the centre of each corresponding to the narrowest portion of the cells. From below, the appearance is similar, but the cells are stellate with numerous intercellular spaces. The *parenchyma* consists of large cells showing a tendency to

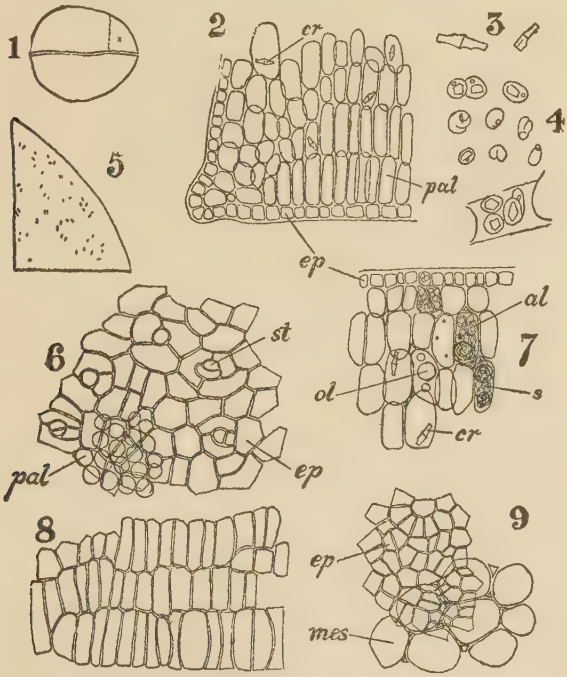


Fig. IV.—1. Diagram of transverse section of the cotyledons, x2; 2. Corner of a transverse section of a cotyledon, showing palisade tissue abutting upon the epidermis of the flat face, x150; 3. Crystals of calcium oxalate, x300; 4. Aleurone grains, x300; 5. The portion of the cotyledon shown in 1 and marked by an x, enlarged to show the distribution of the crystals, which are represented by short dashes, x8; 6. Epidermis from flat face of cotyledon, surface view, x150; 7. Portion of a transverse section of a cotyledon, showing epidermis from curved side and the underlying parenchyma; contents are shown in a few cells only, x150; 8. Epidermis of radicle, surface view, x150; 9. Epidermis from curved face of cotyledon, x150; *cr.* Crystal of calcium oxalate; *ep.* Epidermis; *al.* Aleurone grain; *s.* Starch grain; *ol.* Oil globule; *st.* Stoma; *pal.* Palisade tissue; *mes.* Mesophyll.

stellate structure, and becoming more elongated as one proceeds from the outer to the inner layers. The intercellular spaces at

the same time gradually increase in size until the tissue assumes the form of an open meshwork. The *aleurone layer* is composed of polygonal cells with evenly thickened walls, 15 to 35μ in either direction ; each cell contains a number of small rounded aleurone grains.

Structure of the Embryo.—The embryo consists of two large cotyledons and a small radicle and plumule. A *transverse*

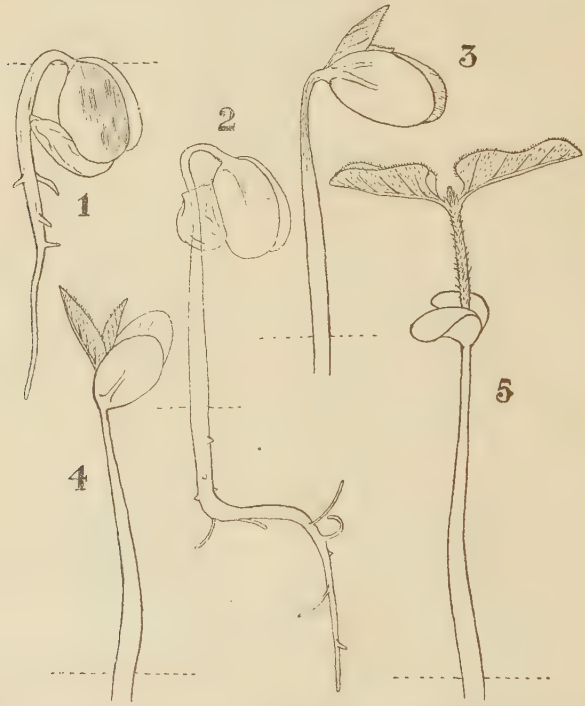


Fig. V.—Five successive stages in the germination of the Soya bean. The dotted horizontal lines indicate the position of the surface of the ground in each case. The numbers indicate the succession of the stages shown. All × 1.

section of a cotyledon shows a semi-lunar shape bounded by a small-celled epidermis, composed of cells 10 to 15μ wide and 15μ high ; their outer walls are rather thicker than the side and inner walls. On the flat side of the cotyledon, the three rows of cells immediately within the epidermis form a well-marked palisade

tissue; their average length is 50μ and width about 15μ. The remainder of the tissue is made up of rounded polygonal cells, separated by small intercellular spaces; they are from 30 to 50μ long and 15 to 25μ wide. All the cells, including the epidermis, are filled with closely packed aleurone grains and numerous droplets of fixed oil. In sections from certain seeds there are also present a few small starch grains which probably indicate that the seeds in which they occur are unripe. The presence of these starch grains has previously been noted and commented upon by Hanausek and by Harz (*Ztschr. Allg. Österr. Apoth.-Ver.*, 1884, p. 474, and 1885, p. 40). A fair number of small prismatic *crystals of calcium oxalate*, arranged in pairs end to end, is scattered through the tissue of the cotyledons; an idea of their number will be obtained from the diagram in Fig. IV., 5. The crystals are easily overlooked; but become plainly visible when a section is examined by polarised light. The double crystals are about 24·5μ long and 4 to 5μ wide; their shape is unusual and characteristic (see Fig. IV., 3), they dissolve in hydrochloric acid, but not in 20 per cent. caustic soda nor in acetic acid.

The *aleurone grains* are oval or irregularly oval in shape and 3·5 to 10·5μ in diameter; they dissolve in caustic soda solution and in 10 per cent. sodium chloride solution; they are stained yellow by iodine and by picric acid and red by eosin. The crystalloids are best seen after double staining with picric acid and eosin; the globoid is not always easily visible, but can be seen in many of the grains. The *radicle* is about 5 mm. long and the plumule, which stands at right angles to the radicle, is 2 mm. long (see Fig. I., 3). The surface of the radicle, as seen in a surface section, consists of very thin-walled parenchyma; the cells of which are obviously in a state of division; their longer axes are at right-angles to the length of the radicle and they are rectangular in shape, being 25 to 60μ long and 10 to 28μ wide.

The structure of the cotyledons indicates that the seeds should exhibit *epigeal germination*, and that the flat faces of the cotyledons should become the upper faces of the green leaves formed from them during germination. This conclusion was tested by germinating some seeds, which behaved as expected. The accompanying drawing shows various stages during the early growth of the seedling. The cotyledons are carried above ground by the formation of a long hypocotyl; they turn green and open out so as to present their flat faces upwards, thus accounting for the structure found in the cotyledons of the seed.

THE POWDER.—The powder should be examined mounted in iodine water, in chloral glycerin, and in phloroglucin and hydrochloric acid; it should also be viewed in polarised light, which

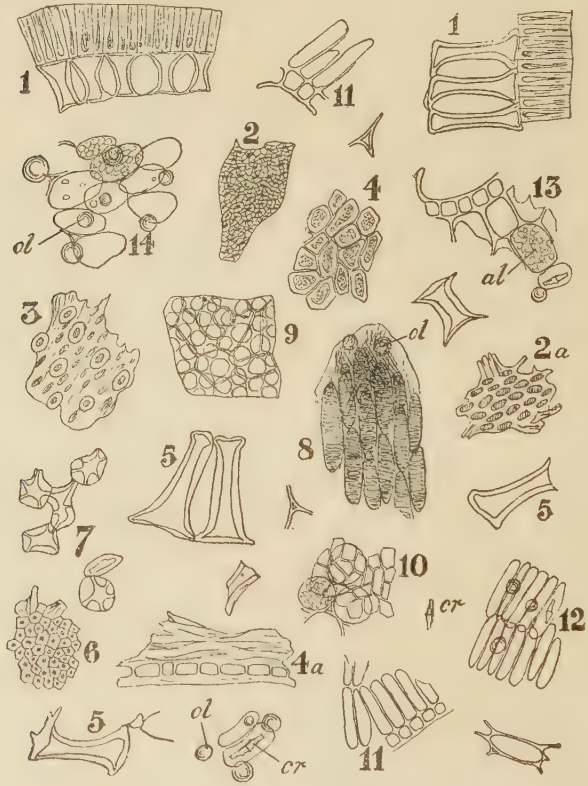


Fig. VI.—Powder of Soya bean. 1. Palisade epidermis and bearer cells in transverse section; 2. Palisade epidermis in surface view from above; 2*a*. The same from below; 3. Palisade epidermis and bearer cells in surface view; 4. Aleurone layer within seed-coat in surface view; 4*a*. The same with compressed parenchyma in section; 5. Isolated bearer cells and portions of such cells; 6. Upper layer of double epidermis from hilum, in surface view; 7. Modified parenchyma and sclerenchyma from region of hilum; 8. Tracheids from hilum-furrow; 9. Epidermis and underlying cells from flat face of cotyledon; 10. Epidermis and underlying cells from rounded face of cotyledon; 11. Epidermis of flat face and palisade cells of cotyledon in transverse section; 12. Palisade cells from cotyledon; 13. Epidermis and cells of mesophyll from rounded face of cotyledon; 14. Cells of mesophyll of cotyledon; *al*. aleurone grains; *ol*. oil globule; *cr*. calcium oxalate crystals. All x150.

quickly shows up both the crystals and any foreign starch grains that may be present. The iodine water preparation shows up the aleurone and the starch, if present; the chloral hydrate makes clear the cellular structure and the crystals, while the

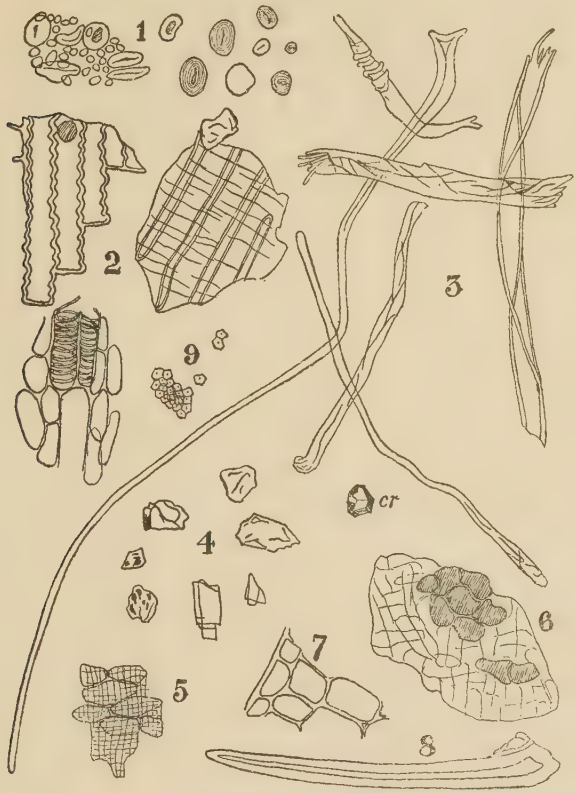


Fig. VII.—Foreign particles found in a commercial specimen of Soya bean meal. 1. Barley starch, some grains of which are partly gelatinized; 2. Three pieces from the husk of barley; 3. Hairs of cotton seed; 4. Grains of sand; 5, 6, 7, and 8. Particles of powder not identified but not belonging to Soya bean; 9. Rice starch; *cr*, a crystal, foreign to Soya bean. All × 150.

phloroglucin and hydrochloric acid emphasize the general absence of lignified elements, the only ones present in the genuine powder being cells from the raphe and the group of tracheids under the hilum and a few slightly lignified cells of the modified paren-

chyma immediately below and near the group of tracheids of the hilum furrow.

Portions of all the structures described in the dissections may be found in the powder; the cells of the cotyledons frequently break up into small fragments, appearing as triradiate pieces with a central small triangular intercellular space. The bearer-cells also are often broken up, and pieces as well as whole cells are commonly found. The *most characteristic elements of the powder* are—(1) The remarkable calcium oxalate crystals, (2) the bearer-cells, (3) the outer epidermis of the seed-coat to which the layer of bearer-cells is frequently attached, (4) the aleurone layer lining the inside of the seed-coat, (5) the general absence of lignified structures and of starch, (6) the entire absence of hairs.

Black and Brown Beans.—Sections of these beans show that the colour is due to pigment in the cell walls of the epidermal cells. The walls are coloured deep crimson in the case of the black beans and pale yellow-brown in the brown beans. The structure of all parts of the seeds otherwise exactly resembles that of the ordinary yellow beans. The seedlings obtained by germinating the dark-coloured beans also closely resemble those grown from the yellow beans.

Examination of Some Commercial Specimens of Cake and Meal.—The first specimen of meal examined was obtained from a provincial dealer; it is very badly adulterated, and contains large quantities of dried grains and of cotton seed; there is also present sand and rice starch and some unidentified additions. The accompanying figure (Fig. VII.) shows drawings of the chief foreign elements found in this meal.

A specimen of Soya bean cake, kindly given to me by Professor Greenish, shows a considerable admixture of pinewood sawdust and also a small amount of cotton-seed hairs.

Another specimen of Soya bean cake was fairly pure, but even this showed a small quantity of cotton-seed hairs.

These results seem to indicate that commercial cake and meal are commonly adulterated, and also suggests the probability that Soya bean oil is frequently adulterated with cotton-seed oil.

Discussion

Professor H. G. Greenish said he thought Mr. Wallis was to be congratulated on doing in a very remarkable manner a very excellent piece of work. Mr. Wallis was not only an excellent

microscopist, but was an artist as well, and that enabled him to draw on paper that which he had seen under the microscope. One might say that the soya bean was not one of the things that come commonly into use, but with the increasing use of soya meal he thought there was not very much doubt that sooner or later they would find ground meal in places in which it really ought not to be; in fact, he had been looking for it for some time past. It was very difficult to distinguish between certain leguminous and other meals. When one contained starch and another did not they could separate them very readily, but when a meal containing starch was mixed with one that did not the problem became a very troublesome and difficult one indeed. Mr. Wallis had shown in his paper how they could detect soya meal, and it seemed to him that the paper was one that would be of great use not only to pharmacists, but also to public analysts generally.

Mr. E. Saville Peck said he would like to add his sincere congratulations to Mr. Wallis on his most excellent paper. He would like to suggest that Mr. Wallis should give the actual name of the plant the seed of which he described. Recently he (the speaker) had been asked to get some specimens of the soya bean, and had had some little difficulty in doing so, but eventually he got a fair quantity from Mr. Marsden, of Liverpool, who gave him three different samples, one of which had been identified by Mr. Burt Davy, who had grown several varieties in Johannesburg, as *Glycine hispida*. The reason that particular specimen was wanted was because it had the property of decomposing urea into ammonium carbonate, and it, therefore, was a very valuable material for the estimation of urea in urine. He also had had occasion to look up the history of the soya bean, and he found a pamphlet written by Mr. Piper and Mr. Morse, of the United States Department of Agriculture on the subject, in which they had illustrated no less than thirty-six different varieties of the soya bean. The pamphlet contained a long list of the different varieties, which were divided into three sub-species. In conclusion, he would again like to say that he thought it would add immensely to the value of the splendid paper to which they had listened if Mr. Wallis could give—perhaps when the paper was reprinted in the *Year-Book*—the actual name and species of the plant, the seed of which he had so carefully described.

Mr. Prosper H. Marsden said that he possessed samples of two or three varieties of soya bean which he should be pleased to

give to Mr. Wallis in order that he might do further scientific work on them. Soya bean cake could be used as a food for animals, but he wished to point out that, as it had an aperient action, it is necessary to combine it with other foods, such as linseed. In conclusion, he felt they were greatly indebted to Mr. Wallis for his paper, and he hoped they would hear further papers of the same kind.

The President said that a huge sum of money was being raised to enable a search to be carried on for seeds rich in fixed oils that might be used either for making soap or margarine. The economic production of fixed oils was entirely dependent upon the value of the residues, therefore, it seemed to him that such researches as Mr. Wallis had made were of the very highest importance to a great number of manufacturers in this country, and he was sure they would all tender to Mr. Wallis their best thanks.

Mr. T. E. Wallis, in replying, said that the criticism seemed to turn on the point that he had not consulted any authority as to the identity of the soya beans described, but he believed that could easily be remedied in time for publication in the *Year-Book of Pharmacy*. He would like to thank all who had spoken for the complimentary way in which they had referred to his paper.

Note.

Mr. T. E. Wallis writes that, following the suggestion of Mr. E. Saville Peck that he should have the identity of the soya beans used authoritatively verified, he has found, on comparing them with a type specimen of the beans of *Glycine hispida*, Maxim, given to him by Mr. Peck, that they agree in all particulars. A specimen of the beans used has also been sent to the Director of the Royal Botanic Gardens, Kew, who has kindly verified them as *Glycine Soja*, Sieb. and Zucc. (*Glycine hispida*, Maxim), the "Soy Bean."

FACTORS RELATING TO THE PHARMACY OF THYROID GLAND

By R. Glode Guyer

At last year's Conference Mr. N. H. Martin contributed a most instructive paper dealing with the seasonable variations of thyroid gland (*Y.B.P.*, 1912, page 408).

In the autumn of last year Mr. Finnemore asked me if I would undertake to make further observations on the thyroid glands obtained in Scotland. I at once put the suggestion into practice, as I felt it was an excellent idea to obtain further territorial information about the thyroid glands, and therefore had the daily supply from the Edinburgh market separated from supplies obtained elsewhere, and a scheme of tabulation such as is now shown drawn up.

By this means a record was kept of the number of lobes contained in each delivery, and their moist weight when trimmed. They were all dried in the same chamber, which has a uniform temperature of 40°C., and the dried weight, before being fat freed, of each separate lot was recorded (see Tabulation No. 1).

At the end of each month the dried glandular substance was bulked together, free from fat, and powdered, and a sample of the month's supply taken and put aside for the estimation of the iodine. Unfortunately the January lot was bulked off with the December lot before the sample was taken, and so for this month there is no record of the iodine factor.

The averages were then made, and these are set out in tabulated form (see Tabulation No. 2), together with the iodine contents.

TABULATION No. 1

Date.	Number of Lobes.	Moist Weight.		Average per Lobe.	Dry Weight.		Average per Lobe.
Dec., 1912.		Lb.	oz.	Grains.	Lb.	oz.	Grains.
11 . .	592	1	14¼	22·35	0	8¾	6·48
12 . .	534	1	7	18·84	0	6¼	5·12
13 . .	179	0	6½	15·88	0	2½	6·11
16 . .	183	0	6½	15·53	0	2¼	5·38
18 . .	764	2	2½	19·75	0	11¼	6·44
19 . .	538	1	14¼	24·59	0	10¾	8·74
20 . .	376	0	14¼	16·58	0	4¾	5·52
24 . .	450	1	4¼	19·44	0	6½	6·32
26 . .	752	2	4¾	21·37	0	12	6·98
27 . .	235	0	7	13·02	0	3	5·58
31 . .	420	1	8	25·00	0	7½	7·81
Total . .	5,023	14	9	20·27	4	11½	6·57

Date.	Number of Lobes.	Moist Weight.		Average per Lobe.	Dried Weight.		Average per Lobe Dried.
Jan., 1913.		Lb.	oz.	Grains.	Lb.	oz.	Grains.
2 . .	566	1	12¾	22·20	0	9	6·95
6 . .	236	0	9½	17·60	0	3½	6·42
7 . .	422	1	2	18·66	6	0	6·22
8 . .	864	2	13½	23·03	0	15	7·58
10 . .	484	1	5¾	19·65	0	7½	6·77
11 . .	90	0	3	14·57	0	1¾	8·48
13 . .	520	1	9¼	21·24	0	9	7·57
14 . .	260	0	14	24·38	0	4¾	7·98
15 . .	545	1	13¾	23·87	0	10½	8·42
16 . .	242	0	10½	18·97	0	4½	8·13
17 . .	200	0	9¼	20·23	0	3	6·56
21 . .	370	1	2¾	22·17	0	6½	7·68
23 . .	336	1	1¾	23·10	0	6	7·81
23 . .	560	1	14½	23·82	0	10	7·95
24 . .	206	0	10½	22·29	0	3¾	7·74
27 . .	329	1	0	21·27	0	6	7·97
28 . .	375	1	1	19·83	0	6	7·00
29 . .	218	0	9½	19·05	0	4	8·02
30 . .	200	0	11¾	25·69	0	3¾	8·20
31 . .	197	0	9¾	21·64	0	3	6·66
Total . .	7,220	22	5¼	21·65	7	11½	7·48
Feb., 1913.		Lb.	oz.	Grains.	Lb.	oz.	Grains.
3 . .	208	0	9¾	20·50	0	3¾	6·84
4 . .	196	0	9½	21·19	0	3	6·69
5 . .	208	0	10	21·03	0	3¼	6·84
6 . .	196	0	9¾	21·75	0	3	6·69
7 . .	200	0	12¼	26·79	0	4¼	9·30
10 . .	208	0	9¾	20·50	0	3	6·30
11 . .	179	0	8¾	21·38	0	2¼	5·50
12 . .	190	0	10	23·02	0	3½	8·10
13 . .	206	0	12¾	27·07	0	3¾	7·96
14 . .	204	0	10¾	23·04	0	3½	7·50
17 . .	206	0	10¾	22·52	0	3	6·36
18 . .	168	0	9¾	25·38	0	3	7·80
19 . .	248	0	15	26·45	0	4¼	7·50
20 . .	195	0	9½	21·30	0	2¾	6·67
21 . .	243	0	13¼	23·84	0	4	7·20
24 . .	198	0	10	22·09	0	3¼	7·18
25 . .	196	0	9½	21·19	0	3	6·69
26 . .	189	0	9¾	22·56	0	3	6·94
27 . .	128	0	8¼	28·19	0	2¾	9·39
28 . .	200	0	11¼	24·65	0	3¾	8·20
Total . .	3,966	13	2¼	23·19	4	1½	7·21

Date.	Number of Lobes.	Moist Weight.		Average per Lobe.	Dried Weight.		Average per Lobe. Dried.
March, 1913.		Lb.	oz.	Grains.	Lb.	oz.	Grains.
4 . .	390	1	2	20·19	0	6¼	7·04
5 . .	200	0	14	30·62	0	4½	9·84
6 . .	204	0	12½	26·80	0	4¼	9·11
7 . .	186	0	12¼	28·81	0	4	9·40
10 . .	196	0	8¾	19·52	0	3	6·69
11 . .	192	0	9¾	22·20	0	2¾	6·22
12 . .	191	0	12¼	28·05	0	3¾	5·58
13 . .	210	0	11½	23·95	0	3	6·21
14 . .	190	0	10¼	23·60	0	3½	8·05
17 . .	210	0	10¾	22·40	0	3½	7·28
18 . .	198	0	10	22·09	0	3	6·22
19 . .	198	1	0¼	35·90	0	4¼	9·35
20 . .	198	0	14	30·90	0	4½	9·94
21 . .	192	0	13¼	30·18	0	4	9·11
24 . .	206	0	11½	26·48	0	3¾	7·96
25 . .	153	0	8¾	25·01	0	2½	7·15
26 . .	227	0	14¾	28·42	0	5	9·63
27 . .	200	1	0	35·00	0	5	10·93
28 . .	202	0	13¼	28·69	0	4	8·66
31 . .	199	0	11¾	25·82	0	3½	7·69
Total . .	4,142	15	9½	26·46	4	14	8·22
April, 1913.		Lb.	oz.	Grains.	Lb.	oz.	Grains.
1 . .	119	0	7¼	26·64	0	2	7·35
2 . .	303	1	11	38·98	0	8¾	12·61
3 . .	309	1	11½	38·93	0	8¾	12·38
4 . .	198	0	15¾	34·80	0	4¾	10·49
7 . .	311	1	3½	27·42	0	6¾	9·49
8 . .	122	0	8¼	29·58	0	2½	8·96
9 . .	464	2	8¾	38·85	0	11¼	10·60
10 . .	481	2	6	34·56	0	10¼	9·32
11 . .	80	0	6¼	34·17	0	1¾	9·57
14 . .	154	0	10¼	29·11	0	3¾	10·64
16 . .	602	2	14½	33·79	0	15¾	11·26
18 . .	600	2	9¾	30·44	0	14	10·20
22 . .	236	1	0¼	30·12	0	5¼	9·75
24 . .	937	5	1½	38·05	1	10	12·13
25 . .	124	0	8¾	30·86	0	3	10·51
28 . .	193	0	14¾	33·43	0	5¼	11·90
29 . .	141	0	10¾	33·34	0	3	9·30
Total . .	5,374	26	4¾	34·25	8	4½	10·78

Date.	Number of Lobes.	Moist Weight.		Average per Lobe.	Dried Weight.		Average per Lobe.
May, 1913.		Lb.	oz.	Grains.	Lb.	oz.	Grains.
1 . .	431	2	3½	36·03	0	9¾	9·89
2 . .	701	3	8¾	35·41	1	1	10·60
5 . .	237	1	1½	32·29	0	4¾	8·76
6 . .	170	0	11	28·30	0	4¼	10·94
7 . .	455	2	7	37·50	0	11½	12·01
8 . .	552	2	10¼	33·48	0	13¾	10·89
9 . .	71	0	5	30·80	0	1½	9·23
12 . .	165	0	11½	30·84	0	4	10·60
14 . .	579	3	1½	37·40	0	13½	10·20
15 . .	386	1	15½	35·75	0	10½	11·90
16 . .	178	0	14	34·41	0	4¼	10·44
19 . .	143	0	10¾	32·88	0	3¼	9·94
21 . .	230	0	14½	27·57	0	4½	8·56
22 . .	482	2	8¾	36·98	0	13	11·79
26 . .	80	0	7¾	42·36	0	1¾	9·57
27 . .	168	0	14¼	37·10	0	4	10·41
28 . .	200	0	14	30·62	0	4½	9·30
29 . .	585	3	3¼	38·32	1	0	11·61
30 . .	168	0	12	31·25	0	4	10·41
Total . .	5,981	29	14¾	35·00	9	2½	10·71
June, 1913.		Lb.	oz.	Grains.	Lb.	oz.	Grains.
2 . .	180	0	10½	25·51	0	3¼	7·89
3 . .	162	0	11¾	31·72	0	3¼	8·77
4 . .	381	1	14¼	34·73	0	8¼	9·47
5 . .	418	1	14¾	32·18	0	8¾	9·15
6 . .	178	0	12¼	30·10	0	4	9·71
9 . .	204	0	13	27·82	0	4½	9·64
10 . .	142	0	8½	26·18	0	2½	7·69
11 . .	324	1	12¾	38·81	0	6¾	9·11
12 . .	474	1	13½	27·22	0	8¼	7·61
16 . .	112	0	6	23·43	0	2	7·81
17 . .	122	0	7½	26·86	0	2¼	8·06
18 . .	67	0	4	26·11	0	1¼	8·14
19 . .	435	1	10¼	26·40	0	7	7·03
20 . .	70	0	3¼	20·30	0	1¼	7·80
23 . .	153	0	8¾	25·01	0	3¼	9·28
24 . .	112	0	6	23·43	0	1¾	6·82
25 . .	80	0	6½	35·53	0	1½	8·12
26 . .	542	2	8¾	32·89	0	8¾	7·06
27 . .	106	0	6¾	27·86	0	2¼	9·30
Total . .	4,262	18	3	29·80	5	0½	8·48

In Tabulation No. 1 it will be seen that there is a great variation

in the weight of the glands, ranging from 18 grains to 38·98 grains, and although the monthly average weight seems to increase steadily, a careful inspection of the Tabulation will show that this is merely a coincidence rather than a real factor, as in each month some supplies were composed of large lobes and others of small lobes, and it is not likely that the sequence of increment of weight can be repeated each year, so as to produce such a steady change in weight with different seasons. This variation is accounted for by the fact that various flocks were killed, sometimes lambs, and at other times cross-breed, half-breed, Cheviots, etc.

In Edinburgh these are the chief breeds which are used, the small Highland mountain sheep being very seldom killed, not being marketed, as a rule, below Perth. The stocks from which these glands were taken were all pastured either in the Border counties or in East Lothian, and therefore it may be assumed that these figures apply equally as well to any English supply, and are not exclusively typical of Scottish glands.

This marked variation in size was a distinct feature and one that called for further investigation. One consignment of one hundred glands was examined, and each lobe weighed separately (see Tabulation No. 3), and the weights were found to range from 11½ grains to 62 grains. If this lot was subdivided into groups, we obtain the following figures: 10 to 20 grains, 23 lobes; 20 to 30 grains, 48 lobes; 30 to 40 grains, 18 lobes; over 40 grains, 11 lobes.

The Codex states that the average weight of each gland is 4½ Gm. or 34·8 grains per lobe. Mr. Martin obtained an average of 22 grains, the glands under consideration give an average of 27·25 grains per lobe. To see how and why such great variations occurred as shown on the tabulations, two visits were made to the slaughter-houses, and I had the glands removed while present, and took full particulars of the class of killed sheep (see Tabulation No. 4). Sixteen cross-breed lambs about four to six months old gave an average of 15·7 grains per lobe, with a maximum of 28·5 grains and a minimum of 7·5 grains. Twelve Cheviots and cross-breeds one year old were next killed, and their glands gave an average of 40·8 grains, with a maximum of 70·5 grains and a minimum of 21 grains per lobe. Four two-year-old cross-breeds gave an average of 28·7 grains, with a maximum of 41 grains and a minimum of 20·5 grains. I wish this last lot of sheep had been more numerous, because it is impossible to establish data upon the product of four.

It is this variation in the age of the sheep and class of breed used which accounts for the great increase of lobe weight in March, April, and May, as then they were killing last season's lambs, or sheep about a year old.

From these figures it will be noticed that the maximum weight per lobe of lambs overlaps the minimum weight per lobe of the one-year-old sheep, and therefore it is quite possible to get a set of lambs producing glands equal in weight to those of one-year-old sheep, and, *vice versâ*, a set of one-year-old sheep producing glands small enough to be classified as lambs.

I was much struck at the time with the fact that in many cases the lobes were unequal in size, and I isolated one gland in particular and found one lobe to weigh 70·5 grains and the other 53 grains only in a perfectly healthy one-year-old sheep. If the tabulations of these glands are carefully examined this observation will be further supported by the fact that there is another lobe, 60 grains, from the one-year-old group, whilst the nearest one to form its partner is only 52 grains.

Various standard authorities, such as the Codex and Squire, give the ratio of the dried glandular substance to the moist as 1 to 5, and Mr. Martin in his paper last year obtained 1 to 3·7, which closely corresponds to the factor brought forth by these tabulations, viz., 1 to 3·6.

It would be interesting to trace the source of this published factor, because it appears, in the light of the present evidence, that this ratio is unattainable, and is likely to be most misleading.

The iodine factor is a vexed question, and one upon which, I venture to think, too much stress is laid.

It is as yet an open question with physiologists whether the iodine factor does represent the therapeutical value of this moist drug. Iodine in small proportions, as is found in this gland, is present in many other parts of the animal system, and in the thyroid glands of certain animals is always absent. Until it can be established definitely that the iodine factor is the measure of the therapeutical strength of the thyroid gland, I do not think it should be made a public standard.

It was felt advisable to adopt Mr. Stuart's process for the estimation of this factor (*Y.B.P.*, 1911, page 414), so that the results should be in direct harmony with Mr. Martin's. In working this process (and the same applies to the other processes) great care had to be taken to ensure complete carbonization, or else a low figure was obtained, and, on the other hand, every pre-

caution had to be taken to avoid too vigorous application of heat, or volatilization of iodine would ensue, and a low reading made. These estimations were made by my colleague, Mr. Stenhouse, to whom my best thanks are due. The results are distinctly interesting, for whilst the individual weights of the lobes varied greatly, the iodine factor maintained a steady equilibrium, considering that we are dealing with an organic substance liable to slight natural variations, and that no seasonable fluctuations are noticeable. (See Tabulation No. 2.)

TABULATION No. 2

	Number of Lobes.	Moist Weight of Lobes.	Average Moist Weight of Lobes.	Dry Weight of Lobes, Not Fat-freed.	Average Weight of Dried Lobes, Not Fat-freed.	Dry Weight of Lobes, Fat-freed.	Average Weight of Lobes, Fat-freed.	Iodine in Fat-freed Dried Substance.
		Lb. oz.	Grains.	Lb. oz.	Grains.	Lb. oz.	Grains.	Per cent.
December	5,023	14 9	20·27	4 11½	6·57	4 1½	5·70	0·258
January .	7,220	22 5¼	21·65	7 11½	7·48	6 10¾	6·46	0·000
February	3,966	13 2¼	23·19	4 1½	7·21	3 9¾	6·37	0·222
March .	4,142	15 9¼	26·46	4 14	8·22	4 3¼	7·10	0·266
April . .	5,374	26 4¾	34·25	8 4½	10·78	6 15	9·00	0·229
May . .	5,981	29 14¾	35·00	9 2½	10·71	8 2	9·51	0·251
June . .	4,262	18 3	29·80	5 0½	8·48	4 0¼	6·60	0·279
Totals	35,968	140 0½	27·23	43 12¼	8·50	37 10½	7·24	—

The iodine factor seems at present to offer a very wide field for further investigation, first by the physiologist and pharmacologist, and then by the practical pharmacist.

The figures now offered appear to support those who advocate 0·2 per cent. of iodine in the dried glandular substance, but until these points are definitely and conclusively determined it seems very unwise to advocate a fixed factor for the iodine content, which may be misleading and factitious, because, as Mr. Martin said last year, it was difficult to distinguish chemically between added iodine and the natural iodine. I think, however, we should endeavour to establish a factor for the ratio between the moist and the dried fat-freed, glandular substance, which factor, according to my experience, would not exceed 1 to 3·5.

Tabulation No. 3

Individual weight of 100 Lobes taken from one delivery. July 3, 1913.

Grains.	Grains.	Grains.	Grains.	Grains.
19	21½	14½	25½	25
38	34	26½	35	19
36	38½	23½	24½	25
23	25½	24	21	24½
24	23½	37	20½	27½
27	40½	27	19½	27
40	18½	22½	19½	30½
41	18½	37	11½	22
40	18	33	17½	32½
42	20½	40	26	50
38	49½	13	19	25½
41½	30	28	25	25½
38½	51½	24½	18	27½
34	51	28	13½	20
51	62	22	18	19½
25½	26½	24	13½	19
21½	43½	33	18	28½
15½	14	21	18½	22½
16	22½	25½	22	33
25½	21	22	17	18

From 10 to 20 grains	23 lobes
From 20 to 30 grains	48 lobes
From 30 to 40 grains	18 lobes
Over 40 grains	11 lobes

Tabulation No. 4

Weight of Individual Lobes trimmed. Collected from

16 Lambs. 4 to 6 months old.			12 Sheep. 1 year old.		4 Sheep. 2 years old.
Grains.	Grains.	Grains.	Grains.	Grains.	Grains.
15½	15	14½	52	44½	31
23	28½	15	53	29½	28½
21	25	9½	70½	30½	29½
22	14½	9½	36½	49	28½
18½	16	7½	36	40	23½
14½	14½	7½	40	34½	20½
14½	18½	7½	53	30½	28½
11	17½	8½	44½	21	41
14½	11	—	49½	21	—
22	18½	—	40	34	—
22	14½	—	60½	32½	—
20	11	—	42	36½	—
	Average, 15·7			Average, 40·8	Average, 28·7

Before concluding these observations it may not be amiss to call attention to the dual standard in vogue at the present time in prescribing and dispensing thyroid gland preparations. It seems to be most desirable that a uniform system of prescribing and dispensing thyroid gland should be adopted. Doctors frequently prescribe, say, 3 grains of thyroid gland in tablet form, and never define whether they mean moist or dried substance. One pharmacist assumes that Thyroideum Siccum is intended, and dispenses the prescription in accordance with this view. The next pharmacist decides that the equivalent of moist glandular substance is intended ; so in one case the patient receives a dose three times as great as in the other, and the clinical results are at variance, and the pharmacist gets blamed. I think that as the B.P. definitely states Thyroideum Siccum as the substance to be used, pharmacists should always employ that standard when dispensing tablets of their own make, or else should be certain that those they purchase conform to it.

In presenting these figures to the Conference, I would like it to be understood that they are taken from working figures taken in the daily routine of the laboratory, and were not calculated upon data obtained in the experimental laboratory, and are, therefore, stated in commercial weights and not in metric terms.

FURTHER REPORT ON IODINE CONTENT OF THYROID GLAND

By N. H. Martin, F.C.S.

In continuation of the series of determinations of iodine content of thyroid gland, which I presented to the Conference last year, I now have the pleasure to submit a similar series for 1912, 1913, and in doing so there is very little to remark. The number of lobes used has been 13,927 against 6,560 in the previous table the average weight of each fresh lobe 1·30 against 1·424. The average iodine in the Thyroideum Siccum 0·407 against 0·343 per cent., and in each fresh lobe 0·096 against 0·091, whilst the average iodine per lobe is 0·00123 against 0·001296. These figures would prove conclusively that so far as a standard (if such is deemed advisable) for sheep's thyroids is concerned, a strength of 0·25 per cent. would not be difficult to maintain in the district from which our supplies are drawn. Following the suggestion which I made last year I hope there may be similar series of analyses from other localities. I hoped to have done something

in the way of collection and comparison, but the claims on my time have made this impossible, and I am only able to contribute a further twelve months' series from the same district, but I trust even this may be of some value as an indication that over a period of two years there has been so little variation.

IODINE CONTENT OF THYROID GLAND, 1912-13

Date.	No. of Lobes used.	Weight of Fresh Lobes.	Weight of T. Siccum obtained.	Average Weight of each Fresh Lobe.	Average Yield of T. Siccum per Lobe.	Iodine in Siccum.	Iodine on Fresh Weight.	Average Iodine per Lobe.
1912.		Gm.	Gm.	Gm.	Gm.	Per cent.	Per cent.	Gm.
July .	1,223	1,492	251	1·21	0·28	0·46	0·108	0·00131
Aug. .	1,944	2,400	449	1·23	0·23	0·47	0·088	0·00108
Sept. .	1,220	1,452	350	1·19	0·28	0·45	0·108	0·00128
Oct. .	1,318	1,429	292	1·08	0·22	0·51	0·104	0·00112
Nov. .	942	988	228	1·04	0·24	0·48	0·110	0·00114
Dec. .	564	695	152	1·23	0·26	0·45	0·098	0·00120
1913								
Jan. .	470	535	164	1·13	0·34	0·39	0·119	0·00134
Feb. .	1,172	1,488	348	1·26	0·29	0·38	0·088	0·00111
Mar. .	1,032	1,638	381	1·58	0·36	0·37	0·086	0·00136
April .	1,584	2,50	739	1·58	0·46	0·28	0·082	0·00129
May .	1,826	3,20	816	1·75	0·44	0·29	0·073	0·00128
June .	632	836	224	1·32	0·35	0·36	0·096	0·00127
	13,927	18,66	4,494	1·30	0·312	0·407	0·096	0·00123

EXTRACT OF MALE FERN

ANALYTICAL NOTES

By C. A. Hill, B.Sc., F.I.C.

The subject of this communication came somewhat prominently into notice about three years ago, when adulteration of the imported extract was rife, the adulterant used being castor oil.

In December, 1911, Mr. E. J. Parry drew attention to the adulteration, and gave analytical data for the extract, pure and adulterated, showing how the addition of castor oil affected its physical characters.

During the last three or four years I have had occasion to examine a considerable number of extracts, in the case of certain adulterated samples to separate and identify the adulterant, to make trial of different analytical methods, and to compare analy-

tical data obtained from genuine extracts of foreign importation with those afforded by extracts prepared under my supervision in the laboratories of The British Drug Houses, Limited.

A summary of the chief results obtained is here set forth in order that they, along with corresponding figures obtained by other analysts, may be available for characterizing as closely as possible this somewhat important extract, which is especially desirable at the present time in view of the fact that a new edition of the British Pharmacopœia is now in course of preparation. The results go to show that an assay process for the determination of the filicic acid is of the first importance; and that this, taken in conjunction with physical and chemical constants for the genuine product, forms the best safeguard against adulteration.

The analytical data are presented in tabular form (Table 1), and from a consideration of the results the following generalizations may be drawn:—

Specific Gravity at 15°.—This is usually higher than 1. In extracts having a low specific gravity the smell of ether is sometimes apparent. The addition of chlorophyll to improve the colour of the extract lowers the specific gravity.

Refractive Index at 40°.—This should not be below 1·49; in fact, it might be advisable to fix the limit slightly higher.

Loss on Drying at 100° C.—Commercial extracts always contain water, and occasionally traces of ether and alcohol also. The loss should not exceed 6 per cent., while 5 per cent. might perhaps be considered a sufficiently high limit.

Petroleum Ether Test.—The proportion, by volume, of extract remaining undissolved when the extract is mixed with ten times its volume of petroleum ether should not exceed 20 per cent. after centrifuging.

Crude Filicic Acid or Filicin.—As determined by the process of the Ph. Helv., genuine extracts appear to yield anything from 19 per cent. to 26 per cent. of crude filicic acid. They occasionally go higher, and I have met such samples; but the requirement of the Swiss Pharmacopœia, viz., 26 per cent. to 28 per cent., appears to me to be too high. I should be inclined to put 22 per cent. as a fair *average* value for a genuine extract, and 20 per cent. as a fair *minimum* requirement, although unadulterated products may occasionally yield slightly less still.

Potash Extract.—This is the portion (obtained as explained below) which is dissolved by 1 per cent. potash, separated, and dried at 100° C.

Potash Insoluble.—This is the portion (obtained as explained below) which is insoluble in 1 per cent. aqueous potash. It is for genuine extracts fairly constant in the neighbourhood of 50 per cent.

In order to obtain the "Potash Extract" and "Potash Insoluble," about 20 Gm. of the extract are dissolved in ether and repeatedly shaken with 1 per cent. aqueous potash until nothing further is extracted. The alkaline liquors are washed with ether, which is then added to the original ether solution, and evaporated, dried, and weighed = "Potash Insoluble."

The alkaline solution is then acidified with HCl and extracted with ether. The ether being evaporated, dried and weighed = "Potash Extract."

These two portions, together with "loss on drying at 100°," constitute practically the whole of the extract.

Potash, as one would expect, extracts much more than does baryta solution, even though it be as weak as 1 per cent.; in fact, the strength of the potash does not make so very much difference. The "Potash Extract" contains, of course, the filicic acid, and by exhausting this extract with baryta solution the same result is obtained as by acting on the original extract by the Ph. Helv. method. In the "Potash Extract" will be found any body of an acid nature added as an adulterant—to increase the assay value.

The "Potash Insoluble" portion will contain practically the whole of any fixed oil added as adulterant, and it becomes therefore of interest to examine this portion. In Table 2 are set forth analytical data relating to this portion as obtained from four of the extracts included in Table 1, including both genuine and adulterated samples. Corresponding figures for castor oil are added. From these physical and analytical characters the adulterant in the adulterated samples was identified as castor oil, and by making use of certain constants for this portion, as obtained from genuine extracts, the proportion of castor oil present in the adulterated samples can be calculated.

Table I

Extract of Male Fern

Sample.	Specific Gravity.	R.I. at 40° C.	Loss on Drying at 100° C.	Petroleum Ether Test.	Crude Filicic Acid.	Potash Extract.	Potash Insoluble.
			Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	0·998	1·4869	—	74·0	13·2	—	—
2	1·0036	1·4940	—	35·0	19·3	—	—
3	1·0075	—	—	15·0	23·75	—	—
4	1·0065	—	—	16·0	22·65	—	—
5	0·9944	1·4925	5·22	3·2	20·22	—	—
6	1·0045	1·4935	3·63	4·3	23·1	—	—
7	1·0109	1·4965	2·44	—	24·55	—	—
8	0·9985	1·4960	4·64	2·0	24·5	48·5	46·86
9	1·024	1·5025	—	8·0	29·75	—	—
10	1·0233	1·4922	6·6	9·0	25·15	42·5	50·9
11	0·998	1·4915	4·4	11·5	21·6	37·9	57·7
12	1·009	1·4965	3·65	7·5	22·0	42·95	53·4
13	0·9829	1·4823	5·03	about 60	11·6	21·43	73·54
14	1·0235	1·5006	2·69	7·0	25·27	39·5	57·81
15	1·0006	1·4874	2·57	65·0	14·1	27·13	70·3
16	1·019	1·4988	4·57	5·0	27·1	39·9	55·53
17	0·9850	1·4920	2·43	6·0	18·92	33·8	63·77
18	1·0179	1·4980	6·52	5·0	23·72	43·36	50·12
19	1·0000	1·4909	6·68	10·5	21·57	36·4	56·92
20	1·0249	1·5036	3·55	7·5	27·82	38·9	57·55
21	1·000	1·4945	4·23	1·5	20·67	37·62	58·15
22	1·0227	1·4990	6·5	10·0	28·1	46·24	47·26
23	0·9921	1·4880	4·84	12·0	18·1	31·53	63·63

Samples, 1, 13, and 15 are adulterated ; number 15 being of quite recent date.

The samples numbered 8, 10 and 12 were of British manufacture, the remainder being imported extracts.

Sample number 11 was of an exceptionally bright green colour and may have contained added chlorophyll, and some others gave the appearance of having had colouring matter added.

Experiments, with mixtures of genuine extract and castor oil, made for the purpose of checking the validity of these calculations, gave reasonably good results.

In a genuine extract the " Potash Insoluble " portion consists almost entirely of tri-glyceride. A glycerol determination gave 10·04 per cent. of glycerol found as against 9·6 per cent. calculated from the saponification value. The high result is explained by the fact that the glycerol was estimated by oxidizing with acid dichromate, so that the presence of any organic matter other than glycerol would tend to a high result.

TABLE 2

ANALYTICAL DATA RELATING TO "POTASH INSOLUBLE" PORTION OF EXTRACT OF MALE FERN

Sample.	Sp. Gr.	R.I.	S.V.	S.V. after Acetylation.	Acetyl Value.	Hydroxyl Value.[1]	Iodine Value.
10	0·9387	1·4715	173·7	198·8	28·6	29·2	—
11	0·9340	1·4729	175·3	207·2	36·1	37·1	120·6
12	0·9372	1·4727	177·4	204·9	31·7	32·5	121·2
13	0·9555	1·4732	170·7	281·1	127·2	140·6	—
Castor Oil	0·965	1·4720	182·0	308·0	149·0	167·8	80/90

Sample 13 was adulterated with castor oil to the extent of 59 per cent. The addition of this oil does not affect the R.I. of the "Potash Insoluble" portion.

[1] The hydroxyl value is the number of milligrams of KOH required to neutralize the acetic acid liberated upon saponifying the product of acetylation of 1 Gm. of the substance. It is calculated by the following formula from the acetyl value (which is the number of milligrams of KOH required to neutralize the acetic acid liberated upon saponifying 1 Gm. of the acetylated substance) :—

$$\text{H.V.} = \frac{\text{AcV.} \times 1000}{1000 - \frac{3}{4}\text{Ac.V.}}$$

It is doubtful, however, whether this line of procedure (*i.e.*, detailed examination of the "Potash Insoluble" portion) has not served its purpose, inasmuch as it would be comparatively easy to use other adulterants, or mixtures of oils, and it would probably be possible to arrange a judicious blend of adulterants which would not only satisfy the characters for the "Potash Insoluble" portion, but even such physical characters as specific gravity, refractive index, and petroleum ether test of the original extract. Any such admixture, however, must lower the filicic acid content, which is thus seen to be the best criterion. Indeed, if this is the ingredient upon which the usefulness of the extract depends, then it is no more than logical to assay the extract for this ingredient. The process of the Ph. Helv., which uses 3 per cent. baryta solution (*i.e.*, saturated), seems to be the best.

Lime presents no advantage over baryta, and has the disadvantage of insolubility.

Magnesium hydroxide, used as a very thin emulsion, was found to give a very low result; while potassium carbonate extracts virtually the same amount as potash.

The results obtained, on the same extract (No. 11 in Table 1), by six different alkaline reagents are shown in Table 3.

TABLE 3

AMOUNTS YIELDED TO VARIOUS ALKALINE REAGENTS BY EXTRACT OF MALE FERN

(Sample No. 11 in Table 1.)

Alkali.	$Ba(OH)_2$.	KOH 1%.	KOH 6%.	K_2CO_3.	$Ca(OH)_2$	$Mg(OH)_2$.
Yield (p.c.)	21·6	37·9	38·8	37·6	20·0	13·6

The process of Kraft is somewhat tedious and tiresome ; in this the sample is extracted with alcohol in the presence of potassium carbonate and the filtered mixture extracted with ether and hydrochloric acid ; the residue obtained by evaporation of the washed ethereal solution is dissolved in amyl alcohol, and the filicic acid precipitated by the addition of methyl alcohol. Until the pharmacology of extract of male fern is better understood, and it has been shown that Kraft's process determines the active body, there does not seem to be sufficient reason for throwing over the simple process of the Swiss Pharmacopœia.

To discuss or even to review the pharmacology of extract of male fern so far as it is understood does not fall within the title of this paper ; but it is perhaps desirable to refer to the chemical constituents of the extract sufficiently to come to some agreement as to what we shall call the residue obtained and weighed in carrying out the assay process of the Swiss Pharmacopœia.

According to Poulson the extract contains—

(1) Filicic acid, active and amorphous, and

(2) Filicin, inactive and crystalline,

and in Poulson's view filicin is the lactone of filicic acid.

Kraft is in substantial agreement, but regards these two bodies as being isomeric. (Kraft's assay process purports to determine this true filicic acid, which is stated to be present in genuine extracts to the extent of at least 5 per cent.) It would seem best, therefore, to refer to the extractive weighed in carrying out the assay process of the Ph. Helv. as "crude filicic acid."

Inasmuch as in the assay process of the Ph. Helv. an aliquot portion of the baryta solution is taken—which solution is saturated with the ethereal solution—any ether-soluble body added to the original extract might fractionally increase the amount of crude filicic acid indicated. Thus chlorophyll itself was found to indicate 1·5 per cent., and castor oil only 0·25 per cent.

Experiments are required to investigate the alleged deterioration of this extract with age, and—if the deterioration be found to occur—to determine the nature of the change which takes place: whether, for example, the assay value of the Ph. Helv. method is materially affected, and if so, whether or not to an extent corresponding with the observed loss of physiological activity; or whether the change is from the active filicic acid into the dehydrated or isomeric and inactive body filicin.

It seems obviously desirable that the pharmacology of this extract should be adequately investigated, and in the meantime that the crude filicic acid as obtained by the baryta process of the Swiss Pharmacopœia should be characterized—in which connection a vendor's recent offer to supply an extract guaranteed to reach a certain standard "*and to contain no added filicin*" gives one furiously to think.

Work in this direction is proceeding, and it is hoped to make a publication at a later date.

I take this opportunity of expressing my thanks to Mr. T. T. Cocking and to Mr. J. D. Kettle for their valuable assistance.

Discussion

The President said that he would at once ask Mr. E. F. Harrison to read the paper by himself and Mr. P. A. W. Self, so that the two communications could be discussed together.

THE ANALYTICAL CONSTANTS OF EXTRACT OF MALE FERN

By E. F. Harrison, B.Sc., F.I.C., and
P. A. W. Self, B.Sc., F.I.C.

In a paper read before the Society of Public Analysts in 1911 on the adulteration of extract of male fern (*P.J.*, December 9, 1911, p. 778), Mr. E. J. Parry laid down limiting figures for certain of the analytical constants of this extract, and stated that genuine samples should give figures falling within those limits. He stated that these figures were obtained by the examination of a number of pure samples of authentic origin, some of which had been specially manufactured for him. The actual number of authentic specimens, however, was not given, and no evidence was offered as to how far they were representative, or whether different samples of the genuine drug might or might not give extracts for which the proposed limits would be desirable. The object of the present communication is to make a contribution

to the available data in regard to genuine extracts, a considerable accumulation of such data being necessary before valid limits can be assigned.

Our results refer to the examination of eleven specimens of the extract, all prepared by ourselves from different samples of the material commercially employed for the purpose. Nearly all these samples were supplied by the firm of H. Finzelberg's Nachfolger, through Messrs. A. and M. Zimmermann, as representing the actual material employed; we desire to express our indebtedness to these firms for their courtesy in sending us this material.

The official drug consists of the rhizome with the bases of the petioles. By separating these in a few specimens and weighing we find that the bases of the petioles form about 70 per cent. of the whole; as noted below, one sample of the drug consisted only of the bases of the petioles. The following is a description of the samples examined:—

No. 1.—Labelled "Harz." Consisted of the rhizome and bases of petioles. Rather dark in colour, otherwise a fair average specimen.

No. 2.—Labelled "Schwarzwald, Württenberg." A normal specimen.

No. 3.—Labelled "Bayern." Large rhizome with bases of petioles.

No. 4.—Labelled "Mosel. Rhein-Preussen." A normal specimen.

No. 5.—Labelled "Bayern." Large rhizome with bases of petioles.

No. 6.—Labelled "Harz." Small rhizome with bases of petioles, dark in colour.

No. 7.—Labelled "Harz." A normal specimen.

No. 8.—Labelled "Harz. Rhiz. filicis crud. depurat. für feine Extracte." Consisted of the bases of petioles only, freed from rhizome, scales, and rootlets.

No. 9.—Labelled "Harz. Rhizoma filicis mundat. für allerfeinste Extracte." Consisted of the bases of petioles, freed from the rhizome and peeled, together with pieces of rhizome also peeled and cut up longitudinally; no scales or rootlets. In making the extract we used the bases of petioles and the rhizome in the proportions in which they were present in the whole specimen.

No. 10.—Labelled "Bayern." Large rhizome with bases of petioles.

No. 11. –Labelled "Stockholm." Rather dark, otherwise a normal specimen.

The three samples of Bavarian rhizome, Nos. 3, 5, and 10, were too large to be covered by the description in the B.P., some pieces being 12 inches long.

The yields of extract and the analytical results are given in the following table :—

Sample.	Yield of Extract, per cent.	Sp. Gravity.	Ref. Index at 20°.	Saponification Value.	Unsaponifiable, per cent.	Insoluble in 10 volumes of Petroleum Ether, per cent.	Crude Filicin, per cent.
1	9·5	1·037	1·5120	251·5	6·5	5·6	27·7
2	7·5	1·037	1·5145	227·0	6·7	3·2	26·5
3	7·7	1·041	1·5122	248·0	6·7	13·0	24·2
4	7·0	1·039	1·5088	254·5	6·6	7·9	24·1
5	9·7	1·052	1·5157	236·5	5·9	14·8	28·0
6	11·6	1·033	1·5088	255·0	5·1	7·7	24·5
7	8·8	1·029	1·4995	259·0	4·3	10·6	19·3
8	7·9	1·023	1·5018	225·0	4·9	9·2	21·9
9	8·3	1·018	1·5036	247·0	4·1	3·8	21·5
10	8·6	1·035	1·5126	259·0	5·0	4·6	24·7
11	10·9	1·037	1·5102	252·5	4·9	4·2	19·7

The crude filicin was determined with baryta by following exactly the directions of the Swiss Pharmacopœia.

The yield of extract thus varied from 7·0 to 11·6 per cent., the two samples of drug which gave these extreme figures differing but little in appearance, but coming from different districts, respectively, Rhenish Prussia and the Harz Mountains. The sample of extract No. 8, made from the bases of petioles alone, gave figures within the extremes given by other samples in all respects except saponification value, which was only slightly lower than that given by No. 2, made from a normal specimen of the drug. But as No. 8 was not the drug officially ordered, it is better to omit it, and the extreme values for the several constants are then as follows :—

Specific gravity, 1·018 to 1·052.
Refractive index, 1·4995 to 1·5157.
Saponification value, 227 to 259.
Unsaponifiable, 4·1 to 6·7 per cent.
Insoluble in petroleum ether, 3·2 to 14·8 per cent.
Crude filicin, 19·3 to 28·0 per cent.

The limits laid down by Parry were :—

Specific gravity, not below 1·000; usually 1·004 to 1·025.

Refractive index, not below 1·500; usually 1·505 to 1·509.

Saponification value, 230 to 250.

Unsaponifiable, 8 to 11 per cent.

Insoluble in petroleum ether, nothing but a little flocculent matter.

Crude filicin, not below 20; usually 22 to 28 per cent.

Thus every one of our genuine samples would be excluded by Parry's limits, and most of them not only in regard to one character, but in regard to two or more. It should hardly be necessary to point out the necessity for great caution in laying down limits for the constants of such an article as this, and the importance of basing such limits on results obtained from a sufficiently wide range of samples.

A character employed by Parry, but not by ourselves, is the combining weight of the fatty acids. We discarded this because we found it unsatisfactory; when the fatty acids are liberated by mineral acid and shaken out with ether, the ethereal solution must, of course, be washed to remove traces of mineral acid, but such washing also gradually removes part of the acids derived from the extract; the washings continue to have an acid reaction, so that no well-defined point can be found showing all mineral acid to be removed, while the combining weight of the acids in the ethereal solution progressively rises.

We had occasion some little time ago to examine samples of extract of male fern obtained from the six principal makers in Germany, and it may be of interest to include the results, which are as follows (the percentage of unsaponifiable was not determined in these cases):—

Sample.	Sp. Gravity.	Ref. Index at 20°.	Sapon. Value.	Insoluble in Pet. Ether, per cent.	Crude Filicin, per cent.
A . .	1·029	1·5084	223	4·9	25·8
B . .	1·029	1·5080	237	2·4	28·1
C . .	1·020	1·4944	218	3·3	24·8
D . .	0·987	1·4910	205	11·1	13·7
E . .	1·015	1·5055	213	3·7	21·2
F . .	0·997	1·4984	225	3·9	19·1

The characters of D are very suspicious, and in any case it should be rejected on account of its low content of filicin. Insistence on Parry's limits would cause the rejection of all but B.

Discussion.

The President said both papers were most interesting. It was a matter of common knowledge that when this subject was first inquired into some of the samples of liquid extract of male fern contained 60 per cent. of castor oil, and the specific gravity was sometimes as low as 0·970. The explanation given by the manufacturers was that as the extract had to be mixed with castor oil before it could be made into capsules, they thought they might start on it at once themselves. The paper of Mr. Harrison was especially important as showing that one should not rush into print and state certain constants which needed substantiation. In justice to Mr. Parry, one might say that his results were put forward hurriedly in connexion with certain law cases which were involved, and were not made on the elaborate scale which characterized Mr. Harrison's work.

Mr. E. T. Brewis said that in common with others at the time Mr. Parry drew attention to the condition of affairs he found there was a good deal of adulteration. One sample contained only 6 per cent. of filicin by the Swiss method. He could confirm what Parry had said with reference to the refractive index. Batches of extract made by himself had given figures which agreed with those put forward by Mr. Harrison. In some foreign samples the ether was not entirely removed. When these extracts were evaporated to get rid of the ether the specific gravity went up and the refractive index came within the limits, but the colour was spoilt. He would like to know whether the authors of the papers had noticed that in taking the refractive index of some—but not all—of the samples of extract one did not get a sharp reading, but the edges of the shadow in the refractometer were fuzzy.

Mr. C. A. Hill thought that the factor to convert Mr. Harrison's refractive index figures (i.e., from 20° to 40°) would be of the order of magnitude of 0·008, and that when this was subtracted from Mr. Harrison's data, the latter would then agree with his own and also conform to the suggested limits. The temperature of 40° had been agreed upon as a standard for the determination of the refractive index of butter and for fixed oils and fats, since it is far more convenient to raise than it is to lower the temperature when working with the refractometer, also because of the increase of fluidity and transparency with temperature. He pointed out that his readings in the petroleum-ether test are taken after centrifuging—a necessary precaution in order to

obviate variations due to emulsions. Even so he considered this test to be of somewhat limited value.

Mr. E. F. Harrison replied that their experience had been the same as Mr. Brewis's—that it was difficult to get a sharp reading with the refractometer. In the case of these genuine samples they had taken the refractive index after mixing with castor oil, and probably Mr. Brewis had done the same, because the genuine extract was too dark to be used as it was. The difference in the sharpness of line might depend on the nature of the extract, whether it was really homogeneous or only apparently so. His only other remark would be in confirmation of what Mr. Hill said, that much work still remained to be done on this subject. When constants were determined in that way they were all very well as far as they went, but they were not a conclusive proof of genuineness. In these days of scientific adulteration it would be easy for any one to produce substances heavily adulterated which would pass a given set of tests, though with the expenditure of more trouble they could be caught. Mr. Hill's suggestion as to treating the crude filicin with potash was in that direction; but much more remained to be done before one would be in a position to say that a sample was genuine. With regard to the refractive index, he thought Mr. Hill would agree that a large majority of the figures on record had been taken at 20°, and he was surprised to hear him say that figures had usually been taken at 40°, and that this was the accepted temperature for getting these results. The gross adulteration with castor oil had now ceased, but there was much of the adulterated extract still about, ostensibly for destruction, so it would be well to continue to watch for it.

The President was sure the meeting would accord its hearty thanks to the readers of the papers. In his Presidential Address he had made a strong point as to the amount of work done by pharmacists for the British Pharmacopœia. The monograph for liquid extract of male fern had been kept back pending the reading of these papers so as to get a satisfactory monograph on the pure products.

AN EXAMINATION OF THE ESSENTIAL OIL OF WITCH HAZEL[1]

By Hooper Albert Dickinson Jowett, D.Sc., and Frank Lee Pyman, Ph.D., D.Sc.

Some years ago we had occasion to examine a sample of the essential oil of witch hazel (*Hamamelis Virginiana*, Lin.), and as there is very little published information on this subject we think the results of the analysis of sufficient interest to communicate.

The only previous investigation of the oil was carried out by Wilbur L. Scoville, whose results are given in the *American Journal of Pharmacy* for 1907, p. 496, as follows :—

"Two samples of oil, obtained from different lots of the grease or crude distillate were examined and showed the following characteristics :—Specific gravity at 25° — 0·8984 and 0·8985 ; refractive index at 20° — 1·4830 and 1·4892 ; rotation +4·6° and +5·05° ; saponification equivalent 3·80 ; saponification equivalent after acetylation 30·3. The greater portion of the oil distilled between 250° and 263° C. Ten volumes of official alcohol were required for solution at 25°. The oil evidently consists chiefly of a terpene with a small proportion of an alcohol (about 7 per cent.), and a still smaller amount of an ester."

Our results agree, on the whole, fairly closely with those of Scoville, and this author's conclusion that the oil consists chiefly of a terpene is confirmed, the chief constituent being a sesquiterpene having $d = 0{\cdot}8970$, α_D +14·88°, and $n = 1{\cdot}4916$. A trace of a phenolic substance, a mixture of fatty acids in the free and combined state, and a mixture of solid saturated hydrocarbons were also isolated, whilst indications of the presence of other compounds, including oxygenated substances, were also obtained.

Experimental

The oil employed for this investigation was specially prepared for us from pure witch hazel twigs. It is present in a minute proportion only, and consequently the amount available for this examination was very small.

The oil was golden brown in colour. It had $d = 0{\cdot}9001$,[2] and $\alpha_D + 4{\cdot}29°$ in a 1 dcm. tube. It was sparingly soluble in 90 per cent. alcohol, and when mixed with a little absolute alcohol

[1] Communication from the Wellcome Chemical Works.
[2] All densities at 15·5°/15·5°.

gave a small quantity of colourless precipitate. It contained 0·6 per cent. of acids calculated as acetic acid, and 7·3 per cent. of esters calculated as $C_{10}H_{17}{\cdot}C_2H_3O_2$. The total amount of oil employed for analysis, 43 Gm., was subjected to the following operations in the sequence given :—

Treatment with sodium bisulphite solution gave no solid compound.

Treatment with 10 *per cent. sulphuric acid* extracted no basic matter from the oil.

Treatment with Sodium Carbonate.—The oil was shaken out five times with a 5 per cent. solution of Na_2CO_3. The alkaline liquid was concentrated, acidified with sulphuric acid and distilled with steam until 1 litre had passed over; the distillate and residue were then separately extracted with ether, and gave fractions A and B respectively.

Fraction A.—0·45 Gm. light brown oil, with an odour reminiscent of that of nutmeg; this was fractionally converted into the silver salt through the ammonium salt.

0·1301 gave 0·0437 Ag. Ag = 33·6.
0·0956 gave 0·0335 Ag. Ag = 35·0.
$C_{12}H_{23}O_2Ag$ requires Ag = 35·1 per cent.
$C_{14}H_{27}O_2Ag$ requires Ag = 32·2 per cent.

Fraction B.—0·5 Gm. semi-solid dark brown oil. This was extracted with light petroleum, which left 0·1 Gm. black resin undissolved, and gave on evaporation 0·4 Gm. light brown oil containing a few crystals. This was rubbed up with dilute alcohol and spread on porous porcelain, when a few colourless crystals remained; these softened at 45°, and melted at 48 49°. The porcelain was then extracted with ether, and the oily acid left converted into the silver salt through the ammonium salt.

0·2318 gave 0·0700 Ag. Ag = 30·2.
$C_{16}H_{31}O_2Ag$ requires Ag = 29·7.

The oil thus evidently contains a mixture of free fatty acids, the amounts of silver found corresponding to those required for acids ranging from lauric to palmitic acids.

Treatment with Potassium Hydroxide.—After the treatment with sodium carbonate the oil was extracted with a 5 per cent. solution of KOH. The alkaline liquid was acidified with sulphuric acid and extracted with ether. The ethereal liquid afforded 0·15 Gm. dark brown sticky oil, with an odour reminiscent of eugenol It differed from eugenol, however, in giving a

chestnut brown colour with ferric chloride. The phenol was converted into its benzoyl derivative, but this could not be obtained in a crystalline form.

Absence of Terpenes

With a view to the removal of terpenes the whole of the oil which remained was heated under 60 mm., when it was found that nothing passed over below 160° C. The absence of terpenes being thus shown, the distillation was discontinued.

Hydrolysis of the Oil

The oil was dissolved in 250 c.c. boiling absolute alcohol to which a solution of 2 Gm. KOH in a few drops of water had been added. After three hours' boiling on the water-bath the liquid was still strongly alkaline. The alcohol was then distilled off and the oil precipitated by the addition of water. The alkaline liquid was completely extracted with ether and this added to the oil. The ether solution of the oil was washed with a little water and dried over Na_2SO_4 and the ether removed. The oil was then twice subjected to fractional distillation under 25 mm. pressure, and the lower boiling fractions refractionated four times under N.P. The oil was thus subdivided into six fractions, having b.p. 210–245°, 245–255°, 255–265°, 265–275°, over 275°, and residues.

Fraction 1.—210–245°. This amounted to 1·4 Gm.; it was a colourless liquid with an odour of safrol. It was analysed, and its density determined, with the following results:

C=83·7; H=11·5 per cent.; d=0·8824.

Isolation of a Sesquiterpene

Fractions II., III., and IV. consisted of a colourless oil with a peculiar smell. They were analysed and their physical constants determined, with the following results:

	Gm.	C %	H %	d.	
Fraction II., 245–255° . . .	2·4	86·8	12·0	0·896	—
„ III., 255–265° . . .	11·5	87·0	12·0	0·897	+10·9°
„ IV., 265–275° . . .	2·4	85·0	11·5	0·897	—

Fractions II., III., and IV. were combined and distilled eight times over sodium, and then refractionated, when the whole

boiled between 255–265° C., the larger quantity passing over at 258–265°. A specimen was collected at 259–260° for analysis.

0·1637 gave 0·5269 CO_2 and 0·1747 H_2O. C = 87·8 ; H = 11·9.
0·1270 gave 0·4087 CO_2 and 0·1361 H_2O. C = 87·8 ; H = 12·0.

$C_{15}H_{24}$ requires C = 88·2 ; H = 11·8 per cent.

It had the following properties :

$$d = 0{\cdot}8970 \; ; \; \alpha_D + 14{\cdot}88^\circ \; ; \; \eta_D^{20^\circ} = 1{\cdot}4916,$$

whence molecular refraction = 66·0. This shows the presence of two double linkings $C_{15}H_{24}{=}_2$, requiring 65·7. The sesquiterpene gave liquid addition products with hydrochloric acid gas and with bromine.

Fraction V.—B.p. over 275° under N.P. was fractionated six times under 25 mm., and the following fractions eventually obtained :—

A.—165–180° — 3·2 Gm. yellow oil. d = 0·8932
B.—180–203° — 4·9 Gm. yellow oil. d = 0·8750
C.—203–213° — 3·2 Gm. yellow oil. d = 0·8570
D.—Over 213° — 2·2 Gm. vaseline-like mass.

Isolation of a Mixture of Saturated Hydrocarbons

It was found that B and C on cooling yielded a colourless crystalline substance difficultly soluble in water, alcohol, or acetone. These fractions and also D were, therefore, mixed with acetone, and the solid frozen out at −10°. The solid was then purified by a series of fractional crystallizations from acetone and absolute alcohol, and was finally obtained in five fractions.

Fraction.	Gm.	C %	H %	Melting Point.
1	0·05	84·5	14·8	51–52°
2	0·1	83·9	14·6	45–46°
3	0·5	83·5	15·0	37–39°
4	0·5	83·1	14·0	36–37°
5	0·8	84·5	14·5	27–29°

$C_{30}H_{62}$ requires C = 85·2 ; H = 14·8. per cent.

These fractions consisted obviously of a mixture of saturated hydrocarbons for the chloroform solution did not decolourize a solution of bromine in chloroform.

The mother liquors from the separation of the solid hydrocarbons were united and the solvents removed, and finally re-

fractionated under reduced pressure (25 mm.), when the following fractions were collected at 165–195° and 195-270°.

Fraction 165–195° (25 mm.).—This amounted to 6·2 Gm. of light yellow oil. It was distilled four times over sodium under N.P., and gave two fractions of colourless oil with the following properties :—

B.P.	C %	H %	d.	α_D (In Chloroform.)	
255–265° – 0·6 Gm. .	87·6	12·3	0·8818	+2·9	(c. = 5·1)
265–275° – 3·3 Gm. .	87·4	12·2	0·8820	+0·25	(c. = 44·2)

This fraction appears to consist chiefly of sesquiterpenes.

Fraction 195–270° (25 mm.).—This amounted to 2·7 Gm. of yellow oil having the following properties, C=76·2 ; H=12·1 per cent. ; d=0·9028.

This substance was optically inactive ; it obviously contained oxygenated compounds.

Acids Obtained by the Hydrolysis of the Oil

The strongly alkaline liquid separated from the oil and completely extracted with ether as previously described was evaporated to a small bulk ; then acidified with sulphuric acid and distilled with steam. After distilling over 1 litre of liquid, the distillate and distillation residue were separately extracted with ether, giving fractions A and B respectively.

Fraction A.—Amounted to 0·5 Gm. of light brown oil. This was converted into the silver salt through the ammonium salt.

0·0817 gave 0·0248 Ag. Ag = 30·4
0·1259 gave 0·0512 Ag. Ag = 40·7

Fraction B.—Amounted to 1·5 Gm. of dark tarry oil. This was extracted with light petroleum, which left 0·8 Gm. sticky black tar undissolved, and gave as residue 0·7 Gm. dark brown oil containing a few crystals. This was converted into the silver salt through the ammonium salt.

0·1480 gave 0·0387 Ag. Ag = 26·1
0·0910 gave 0·0230 Ag. Ag = 25·3

The amounts of silver found in the subfractions of fraction A indicate a wide range of fatty acids ; the figures, obtained from fraction B, are probably too low owing to the accompanying resin.

DISCUSSION

DR. F. B. POWER said he would like to ask whether the oil examined by Dr. Jowett had been mechanically separated from the water or whether it had been extracted by means of ether. They knew that some of the volatile constituents of plants were contained to a very small extent in the oil, but might be present in larger amount in the water from which the oil had been separated.

MR. H. FINNEMORE asked if Dr. Jowett could throw any light on an aldehyde which was said to have been isolated.

DR. JOWETT, in reply, said that the water from which the oil had been separated had been examined, but nothing had been found, neither had they found an aldehyde in the essential oil.

THE PRESIDENT, in proposing a vote of thanks to Dr. Jowett and Dr. Pyman, said that he felt sure all present were very much obliged to Dr. Jowett and the other representatives of the Wellcome Research Laboratory for the work they had done.

ERGOT AND ITS PREPARATIONS: A CRITICAL REVIEW OF THE REQUIREMENTS OF THE BRITISH PHARMACOPŒIA [1]

BY F. H. CARR, F.I.C., AND H. H. DALE, M.A., M.D.

Until the last few years the chemistry of ergot, and especially of its active principles, has been so obscure and confused that the preparations representing this drug in the various pharmacopœias have necessarily had a traditional rather than a scientific sanction. Nor can it be held that the attempts to standardize these preparations physiologically, which naturally followed the successful application of a physiological criterion to the heart tonics, greatly improved the position. All such attempts involved the assumption that the particular effect measured—cyanosis of the cock's comb, rise of blood-pressure, or contraction of isolated uterine muscle—gave an index of therapeutic activity. When we find one observer regarding a fall of blood-pressure, another a rise of blood-pressure, as the characteristic effect of the unknown active principle, it is hardly matter for surprise that the results of physiological standardization were not concordant, or that there are cases on record in which one and the same extract, submitted to different authorities, using different

[1] Communication from the Wellcome Physiological Research Laboratories, Herne Hill and the Wellcome Chemical Works, Dartford.

criteria of activity, was condemned as inert by one and reported as highly active by another.

Now that the chief active principles of the drug have been isolated in a state of chemical purity, the constitution of these compounds in some instances confirmed by synthesis, and the mode of action of each worked out in full detail, it seems opportune to submit to the test of this new knowledge the pharmacopœial requirements for the drug and its preparations. From this point of view we propose to criticize especially the sections dealing with ergot in the British Pharmacopœia, as last revised in 1898, which were based on the best knowledge available at the time of that revision.

The specific active principle of ergot, by the presence of which its activity is differentiated from that of all other known substances, is the alkaloid ergotoxine, first isolated as crystalline salts and so named by Barger and Carr in 1906, and simultaneously prepared in amorphous form by Kraft, who suggested its relation to the inert crystalline ergotinine (isolated by Tanret in 1876), and called it "Hydroergotinine." It is to the presence of ergotoxine that ergot owes its dangerously poisonous properties, including the power of producing gangrene; to ergotoxine also its therapeutic activity, in promoting contraction of uterine and arterial muscle, is undoubtedly due in large measure.

In addition to this specific active principle, however, ergot has been shown by Barger and Dale to contain in varying, but frequently in considerable, proportion the physiologically active members of the series of amines derived from aminoacids by splitting off CO_2. These are present in many fungi, and there seems little room for doubt that their abundance in certain ergot extracts is in part due to putrefactive changes taking place during the preparation of the extract. Two of them especially have important physiological activity, viz.—(1) *p*-hydroxyphenylethylamine ("Tyramine"), which has an action of the same general type as the active principle of the suprarenal gland, and was the substance chiefly concerned in the widely recommended standardization of ergot by the production of a rise of blood-pressure; and (2) β-iminazolylethylamine ("Ergamine"), which has an action of peculiar intensity on plain muscle, and particularly so on that of the uterus, and was, therefore, the most important factor in methods of standardization based on observation of the direct action of ergot extracts on uterine muscle.

Notwithstanding their wide distribution in substances other than ergot, there seems no room for doubt that these amines, in addition to being of scientific interest, make an important contribution to the therapeutic value of ergot extracts. It is matter for regret that the evidence on this, the really essential, point of the relative importance of the different principles in therapeutic action, as distinguished from pharmacological experiment, is not yet as complete as could be wished. Making use, however, of the available evidence, some of it published, some of it embodied in private reports from clinical observers, we feel justified in drawing the following conclusions, and in endeavouring to make them the basis of a rational criticism of the current pharmacopœial preparations, instructions, and requirements :—

(1) Ergotoxine is the essential active principle of ergot, and is capable by itself, in suitable doses, and when given by intramuscular injection, of producing the true therapeutic effect of ergot. The proportion of available ergotoxine present in a sample of ergot should be the guide to its suitability for pharmaceutical use. Preparations of ergot should be designed to extract all the ergotoxine from the ergot and retain it in stable solution.

(2) The active amines have individually an important stimulant action on the muscular wall of the human uterus; this is especially the case with "Ergamine." Their presence in ergot extracts, however, owes its chief importance to their adjuvant and synergistic effect on the action of ergotoxine. Given equal ergotoxine values, an ergot which also contains a high proportion of amines will be the better. The ready solubility of their salts in water and alcohol renders their extraction a matter of no difficulty. Certain desiderata for ergot and its preparations may thus, it seems to us, be clearly indicated. They may not all be perfectly compatible; on some points compromise may be necessary. However that may be, the existing pharmacopœial criteria for the drug and its preparations have no deliberate relation to any of them.

Unofficial Ergots

The British Pharmacopœia, in common with others, demands that ergot of rye shall alone be used. This was a reasonable restriction when there was no means of testing the therapeutic efficacy of the ergots of other grasses, or of standardizing the activity of their preparations. Now that the activity of such

alien ergots can be gauged with some confidence, we suggest that there is very good reason for reconsidering this attitude. Many years ago Kobert reported that, with the comparatively crude methods then available, he had observed a very high degree of activity in an ergot growing on a wild grass from Algeria. In the light of our present knowledge it is clear that the activity with which Kobert was concerned was that due to ergotoxine; so that his observation established a presumption in favour of the view that ergots other than that of rye would be found to contain ergotoxine, and that the proportion of the alkaloid would probably be in some cases higher than that found in rye-ergot. We have recently had the opportunity of examining ergot from the tall fescue grass (*Festuca Arundinacea*), which grows wild in vast, swampy areas in New Zealand, and is said to be constantly and heavily infected with ergot. Of this ergot one of us received a sample through the kindness of Messrs. J. Carter and Co., and, by a curious coincidence, another unsolicited sample of the same ergot was received a few weeks later, having been sent from New Zealand by Dr. Levinge, of Dargaville, New Zealand, who sought information as to the possibility of its value. We examined this ergot by the methods which we have applied to a number of samples recently. One of us (H. H. D.) prepared an extract with 60 per cent. alcohol, acidified with acetic acid. This was evaporated to small bulk *in vacuo*, the residue taken up in dilute caustic soda, and this solution cleared by centrifugalizing at high speed. An estimate of the ergotoxine present was made by determining the smallest doses sufficient to produce in a cat of average size the vasomotor reversal (Dale). A good ergot of rye produces this effect in a dose corresponding to about 1 Gm. of the drug. Occasional samples have been met with in which less than 1 Gm. sufficed to produce this effect; but these are exceptional in the case of rye ergot. Of the extract from Festuca ergot a dose corresponding to 1 Gm. was found to be far more than was necessary. 0·5 Gm. was also too large; 0·25 Gm. was just not sufficient. The effective dose, therefore, lay between 0·5 and 0·25 Gm., and was judged as about 0·3 Gm. The dose of ergotoxine needed to produce the effect in question is in the neighbourhood of 1 Mgm. So that 0·3 Gm. contained 1 Mgm., or about 0·3 per cent., of ergotoxine, and the Festuca ergot was estimated to be three times as active as the average specimen of good rye-ergot, containing about 0·1 per cent. of ergotoxine. Meanwhile a chemical determination of the ether-soluble alkaloids by a new

method, of which the details will be published when it has been more thoroughly tried, was carried out by the other author (F. H. C.). The chemical estimate gave an alkaloidal content of 0·34 per cent., the greater part being ergotoxine. Since good specimens of rye-ergot seldom give a yield of more than 0·1 per cent. alkaloid by this method, the chemical examination made quite independently and in ignorance of the physiological finding likewise placed the activity of the Festuca ergot at upwards of three times that of good rye-ergot.

We have also examined a specimen of wheat ergot obtained from Sweden. The physiological method indicated that this contained more ergotoxine than the average good rye ergot, but less than half that contained in the Festuca ergot. The chemical examination showed in this instance 0·12 per cent. alkaloid, a finding which again corresponded fairly well with that of the physiological test.

Both these ergots, as shown by their action on the isolated uterus, also contained a normal proportion of the active amines, and were in every way suitable for the preparation of active extracts; though it is true that the introduction of the potent Festuca ergot into pharmacy as an alternative to rye ergot would not be justified without the establishment of a standard of alkaloidal content or of physiological activity. In view of the fact that the supply of ergot from rye or other cereals is likely to diminish with the spread of scientific agriculture, the value of the ergot of Festuca, and probably of other wild grasses, as a source of the only active principle for which ergot is needed seems to us worthy of attention.

The Pharmacopœial Preparations

We have indicated above the desiderata which, in our opinion, should be fulfilled by ergot extracts. We have now to consider how far these are fulfilled by the preparations of the British Pharmacopœia. Ergotoxine has properties very unusual in an alkaloid. Its salts possess very little true solubility in water, and not much in dry alcohol. They are more soluble in mixtures of alcohol and water than in either solvent alone. In pure water they form colloidal solutions, from which they are readily thrown down by strongly ionised acids or their salts. In the presence of alkalies, such as ammonia or sodium carbonate or hydrate, ergotoxine is unstable. Boiling with absolute ethyl

or methyl alcohol converts it into its anhydride, the crystalline ergotinine of Tanret, which is physiologically inert. On the other hand, weak acids, in watery or dilute alcoholic solution, convert the inactive ergotinine into ergotoxine. It will be clear from a consideration of these properties that the ideal extract for obtaining the full proportion of ergotoxine from a given ergot, and for retaining it in solution, will be made with moderately dilute alcohol, acidified with a feebly dissociated acid, such as acetic, tartaric, or phosphoric acid. We may note, in passing, that such an extract exists in the fluid extract of the U.S.P., and the method of its preparation is understood to have been chosen as the result of a series of careful clinical trials. From the point of view of securing the presence of ergotoxine, it would be difficult, on the other hand, to find worse methods than those laid down for the preparation of the extracts of the B. P. The method for making the Extractum Ergotæ (Ergotin) begins rationally indeed by extracting with 60 per cent. alcohol. In actual practice it is found that a certain amount of the ergotoxine which is obtained by this initial extraction is lost during the removal of the alcohol by concentration, and still more is thrown down when diluted hydrochloric acid is added. Such addition, as mentioned above, would precipitate ergotoxine even from pure solutions ; and in this instance the process is facilitated by the absorbent action of the acidic resins which are thrown down. When these are filtered off the filtrate is practically free from ergotoxine. We have been able to detect no more than traces, even by the delicate physiological reaction, in ergotin prepared by careful adhesion to the official formula, from ergot of first-rate activity. On the other hand, such ergotin contains the active amines present in the original drug, together with substances of no value and some toxicity, such as choline, and a large amount of inert matter. It usually causes some rise of blood pressure, due chiefly to "Tyramine," when injected intravenously, and this is preceded by a fall of pressure, due chiefly to "Ergamine," the presence of which is better recognized, and the proportion roughly estimated, by the effect on the isolated uterus.

While the process for Extractum Ergotæ (Ergotin) starts by extracting the ergotoxine, and gets rid of it at a later stage, that for the Extractum Ergotæ Liquidum extracts only a small and variable proportion, ergotoxine salts, as pointed out above, being very slightly soluble in water. The presence in ergot itself of

feebly dissociated organic acids, and the formation of such acids by the fermentative changes which occur during the preparation of the extract, assist in varying degree the solution of traces of ergotoxine, but this effect is to some extent counteracted by the boiling down of the extract, especially if this is performed with free access of air. In any case the liquid extract would be expected to contain only a very small and variable fraction of the ergotoxine in the ergot. This expectation is entirely confirmed by the physiological test, according to which even freshly prepared liquid extracts from highly active ergot contain at best little, and often hardly any, ergotoxine.

The liquid extract, on the other hand, is rich in amines, and the proportion of these present may be materially increased by the incipient putrefactive changes occurring during the second extraction required by the official process. It is most probable that the presence of these substances is chiefly responsible for the reputation of the liquid extract in therapeutics.

In the light of these facts, we suggest that the retention in the Pharmacopœia of the present method of preparing both extracts is undesirable. The amines, to which they chiefly owe what activity they possess, can easily be obtained pure from other sources, and it is not reasonable to depend for their administration on their occurrence, partly as the result of haphazard and uncontrollable putrefactive changes, in the extract from a relatively expensive drug owing its specific activity to a totally different substance, which is mostly lost in the extraction process.

The little-used Infusum Ergotæ is open to similar criticism to the liquid extract in that it is a watery extract of a drug whose specific active principle is but very little soluble in water. The fact that it is made with hot water, and therefore rich in collodial constituents such as dextrin, probably assists the retention of some ergotoxine in suspension. Probably the old-fashioned method of stirring up the finely powdered ergot with hot water and administering without straining is the most effective way of administering the infusion, though lacking in pharmaceutical elegance.

Lastly, the ammoniated tincture, being an alcoholic preparation, contains initially a larger proportion of ergotoxine than those already mentioned. The addition of ammonia, however, seems in every way undesirable, since it frees the ergotoxine in the unstable basic condition, and ensures the presence of a high

proportion of acidic resinous substances, which must inevitably be precipitated in the stomach and delay absorption.

We suggest, therefore, that the sections of the British Pharmacopœia relating to ergot need revision in the light of present knowledge, the changes indicated being as follows :—

1. The use of ergots other than that growing on rye should receive official sanction, provided that an acceptable method of standardizing for active alkaloid can be found.

2. The present Extractum Ergotæ (Ergotin) should be abandoned. If a soft extract is needed, as in the preparation of pills, the extraction should be carried out with 60 per cent. alcohol, and to this citric acid should be added instead of hydrochloric. The acid might with advantage be added to the alcohol before the extraction is performed. Such a product could be evaporated to a soft extract without filtration, and would contain practically the whole of the active constituents of the ergot.

3. The present Extractum Ergotæ Liquidum should be abandoned, and the Fluid Extract of the U.S.P. adopted in its place. The latter is prepared by extraction with 49 per cent. alcohol containing 2 per cent. of acetic acid, and appears to be a thoroughly satisfactory preparation. Its adoption would have the further advantage of tending to international uniformity. If there is any reason for including an aqueous extract of ergot, weak acetic acid should be employed in place of water for the maceration.

4. The Injectio Ergotæ might be abandoned. The Pharmacopœia should include suitable salts of ergotoxine, which might be injected alone or with suitable proportions of the active amines.

5. A satisfactory tincture could be made with 60 per cent. alcohol, without ammonia, but the adoption of a fluid extract prepared with dilute acidified alcohol in place of the present liquid extract would seem to make the inclusion of a tincture unnecessary.

Discussion

The President, in opening the discussion, said the paper was one of those ideal ones in which the chemical facts and the physiological facts were put well together. There was one very important point made by Mr. Carr from a commercial point of view, and that was as to widening the source of the supply of

ergot. Within recent years the supply had diminished, owing to drought; therefore it would be a great advantage if it could be obtained not only from different countries, but from different plants, which were capable under certain conditions of producing ergot. It was not quite clear from Mr. Carr's remarks whether or not there was an acceptable method of chemical standardization; but he understood there was no standardization in the new Pharmacopœia based upon physiological tests. At the same time, he hoped it was not too late to modify certain old-fashioned processes even of the Pharmacopœia on the lines suggested, from a pharmaceutical point of view, by Mr. Carr, more especially with regard to the liquid extract and the solid extract. He felt sure those who were nominally the Committee of Reference in Pharmacy would pay very great attention to the results communicated to them by Mr. Carr and his co-worker.

Mr. E. M. Holmes said he had not been an active pharmacist for forty years, but he would like to point out that when he was in pharmacy he found no difficulty whatever in getting ergot which was quite satisfactory to doctors, provided it was kept perfectly dry. In the Pereira Collection there were a large number of ergots obtained from wheat, rye, and other plants. There were also a large number of small grasses from which ergot could be obtained, but they varied very much in size, the smallest being from about the eighth of an inch to a quarter of an inch at the outside and the largest, known in Algeria as the Ergot of Diss, reaching about 2 in. in length. It had been said that the fungus was the same whatever grass it grew upon, and therein lay an interesting point. He understood Mr. Carr to say that the ergot produced from different plants might vary. In the marshy districts of the country a grass, *Molinia cœrulea*, grew which was almost invariably affected with ergot, and there was no question as to its activity because cases of abortion had occurred amongst cattle through eating the grass. That was an ergot that could be obtained in this country and experimented with.

Mr. C. A. Hill said he would like to ask, supposing all other chemical difficulties were overcome, ought they to standardize their ergot preparations for ergotoxine only or for other active principles as well.

Mr. J. H. Franklin said he regarded the paper as a very important one from a commercial standpoint; it practically meant the opening out of new sources of ergot. He had had long

experience of making liquid extract of ergot with diluted alcohol, and he had been asked to read a paper at Cambridge, for which the results were rather hastily got together; nevertheless they showed conclusively that there was a wonderful improvement in the preparation when made as suggested by the authors of the very learned paper to which they had just listened.

Dr. C. Symes said some years ago there was an active preparation of ergot, well known in the Liverpool district, for use in a concentrated form hypodermically. It had been supplied for many years to the medical profession, and he did not remember any case in which there had been a complaint as to its being in any way inactive, although a fair amount of heat was used in evaporating it during the process of preparation.

Mr. F. C. J. Bird said he would like to ask Mr. Carr if he could give any information as to the solubility of ergotoxine in glycerin, as he understood that certain medical men used extract of ergot made with glycerin.

Mr. H. Finnemore said he thought they were all indebted to the authors of the papers for giving in such a concise form the results of the work which had already been done with regard to ergot. He would like to ask if the authors of the paper could say if any experiments had been conducted by biologists on the question of the growth of the fungus on other media. The use of ergot was going up year by year, but owing to the improvements in scientific methods of agriculture, the production was going down, and he thought they should look to a more artificial source than the authors had brought forward—namely, the growth on other grasses. Another point to be taken into consideration was that before they could displace the injection of ergot they would have to include in the Pharmacopœia salts of ergotoxine, and he would like to ask the authors if ergotoxine were a commercial article, and whether it was patented or obtainable in the ordinary course of commerce.

Mr. J. Grier said it seemed to him that the weakness of the paper—if he could use the word "weakness" with regard to such a paper—was that it did not attempt to describe any method of standardization which could be followed out, for it seemed to him if they were to alter the methods of making the preparations it would be necessary to have some reliable method of standardization. He would like to know whether they were to take the fall or the rise of blood-pressure, in the physiological standardization, as indicating activity. There was also the cock's comb method. The

chemical method for ergotoxine content was not described in the paper, and in any case it would have to be very carefully tested by different workers before it could be adopted officially. The use of an acid menstruum so as to convert the inert ergotinine into active ergotoxine was an important point, as it would increase the activity of the preparation.

Then there was the question of variation in the crops. He thought it was quite well known that the quality of the crop was not always the same; some years there was a very bad crop, and for that reason alone they must have some consistent method of standardization. For instance a commercial firm would probably take a number of samples for that particular year, and would get a certain effect based on the average of the year's crop; but that standard might be very different from the one that was made the previous year or the year following when the crop was good. This is simply physiological "testing" without "standardization," and would appear to be all that is done in some cases of so-called physiological standardization.

Dr. H. H. Dale said he thought, as being responsible with Mr. Carr for the paper, he was entitled to say that he thought the last speaker had hit the nail fairly on the head with regard to the weakness of the paper, but it was weakness which they recognized, and one which, it seemed to him, only more knowledge could overcome. As a medical man, he had no hesitation in saying the difficulty was really not so much on the pharmaceutical as on the medical side. As present they had the slenderest information as to what it was the medical man wanted. It became clear early in their investigations that not only were they adopting different criteria, but that they were actually standardizing different principles. The object of the paper was to try and clear that up, and, without coming to any final conclusion, to show at what stage they were at present. What they needed, above all, to put the ergot question on a really satisfactory basis was more clinical experience. If medical men wanted ergotoxine, then ergotoxine could be obtained, and, as Mr. Carr would probably tell them in his reply to Mr. Finnemore's question, ergotoxine was a substance which it was open to anybody to make. On the other hand, if the amines of ergot were what medical men needed, then personally he thought ergot had no proper place in the Pharmacopœia at all, since these principles could be produced much better in other ways. On the whole, the evidence available pointed very definitely to ergotoxine

as the constituent which was, above all, important, and that being so, he thought that by some method or other ergotoxine ought to be estimated. There were one or two methods of doing that: the American workers had for many years used the action on the cock's comb, which had been known as a scientific fact almost since the Middle Ages, and he had himself some years ago described a peculiar action on the blood-pressure, a point on which other people had not obtained much success, for the reason that they were trying to apply a test for ergotoxine to a preparation which contained none, and, similarly, they found when people used the cock's comb test and found it useless they were using the liquid extract of ergot of the B.P., whereas American workers who habitually used the cock's comb test with success used the fluid extract of the U.S.P. He thought if they could get an ergot with a high proportion of ergotoxine that would be a good indication of its value; on the other hand, ergot which had been kept for a year, and had gone moist, and was then re-dried, was found on being tested to contain no ergotoxine or other active constituents. Mr. Carr was at present working to see whether he could devise a better ergotoxine standardization by chemical means than they had at present, and, on the whole, the results had come out in good agreement with physiological methods, and there seemed good hope of a chemical standardization being possible.

Mr. E. T. Brewis said he would like to ask Mr. Carr whether glycerin was a suitable solvent for the active principles of ergot. He recalled that a preparation which formerly was in very great vogue at a Dublin hospital was made by macerating the ergot first with a mixture of glycerin and water and subsequently with alcohol.

Mr. F. H. Carr, in replying, said the whole subject was one in which they were making progress, and they had got sufficiently far to be able to modify and improve present methods of making pharmacopœial preparations. He should like to say that Dr. Dale's method of physiologically testing ergot, to which Dr. Dale had so modestly referred, was in reality a very delicate method of determining the proportion of ergotoxine present, and he might say that the whole of the progress in our knowledge of ergot obtained during the last decade was due entirely to the success of Dr. Dale's method. If they would refer to the paper they would see that the authors had dealt more fully with that point than he had done in speaking. They had a chemical method in

hand which he did not give in detail because he was not satisfied with it at its present stage, but it had enabled him to get a crystalline ergotoxine phosphate, and it enabled him to weigh a total alkaloid, part of which readily crystallised. The reason why the method was not really satisfactory was that ergotinine was inactive and ergotoxine active. It seemed to him the future of the method depended upon arriving at some process which did not involve the change of ergotoxine into ergotinine. In answer to Mr. Hill's question, he thought ergotoxine only should be the criterion of the test of ergot. Mr. Franklin suggested that liquid extracts were improved by using alcohol; in fact, he quite confirmed the argument of their paper. Dr. Symes raised the question as to whether evaporation by heat or *in vacuo* was found to give any difference. If the extracts referred to had been submitted to the physiological test, he personally had not much doubt that Dr. Symes would have found a small difference between that which was evaporated *in vacuo* and that which evaporated in the air in favour of the former; but a liquid extract of the Pharmacopœia would very likely have so little activity that the difference between the two would not be worth considering. Mr. Bird and Mr. Brewis had raised questions in regard to glycerin mixtures. He had no information to give in regard to tests on glycerin extract of ergot, but he did know from the properties of ergotoxine that although glycerin was not a good solvent it was one of those substances which greatly assisted the retention of ergotoxine in solution. If they used glycerin and alcohol in the manner described he felt sure they would obtain a preparation superior to the official liquid extract, though he thought inferior to the U.S.P. extract. As regards the point raised by Mr. Finnemore, he did not think that attempts to grow ergot on other media had ever succeeded; and, in further reply to Mr. Finnemore, he would point out that ergotoxine was a commercial substance at present, the method of preparation had been published and it was open to any one to make it.

THE DETERMINATION OF HYPOPHOSPHITES, WITH NOTES ON COMMERCIAL SAMPLES

By T. Tusting Cocking, and James D. Kettle, B.Sc., F.I.C.

The use of potassium dichromate for the assay of hypophosphites has not hitherto been proposed, so far as we have been able to ascertain.

The advantage of using dichromate rather than other oxidizing agents is that the pure salt is readily obtainable, its solution is very stable, and an exact volumetric solution may be prepared by weighing the requisite quantity of the pure dried salt, further standardizing being unnecessary. By its use we have obtained results both concordant and accurate, and have checked our figures against the gravimetric process suggested by Jowett,[1] and also against the bromine method of Rupp and Kroll[2] with satisfactory results, as shown below :—

Salt.	Dichromate Method.	Rupp and Kroll's Method.	Jowett's Method.
1. Calcium hypophosphite . . .	96·35	96·5	—
2. Sodium hypophosphite	89·2	90·3	88·7
3. Sodium hypophosphite	89·5	89·2	—
4. Sodium hypophosphite	88·25	89·0	88·4
5. Sodium hypophosphite	88·4	90·2	88·9

Dr. Jowett's process is accurate, but tedious to carry out where a number of samples have to be examined. His method is to remove phosphites and phosphates by means of lead acetate, precipitate the excess of lead as sulphide, and then oxidize the hypophosphite to phosphate by the addition of potassium chlorate and hydrochloric acid. The determination of the phosphate is carried out in the usual manner by precipitating as magnesium ammonium phosphate and weighing as $Mg_2P_2O_7$.

Rupp and Kroll's method of oxidizing by excess of bromine and subsequent titration of the excess, is also exact, but requires very delicate handling to avoid loss of bromine, with consequent high results.

Whereas in Jowett's process the excess of lead used to precipitate phosphite must be removed before oxidation, we have

[1] *Year-Book of Pharmacy*, 1898, pp. 409 *et seq.*
[2] *Journal of the Chemical Society*, 1911. Abstracts II., 1133.

found that the presence of lead is not objectionable when using dichromate.

The method we employ is to oxidize the hypophosphite by means of excess of dichromate and sulphuric acid, any phosphite being first removed by precipitating as the lead salt. The excess of dichromate is then titrated in the well-known manner with potassium iodide and standard sodium thiosulphate. A normal solution of potassium dichromate containing 49·033 Gm. per litre is used. The working details of the method are as follows :—

2·5 Gm. of the salt under examination are dissolved in 40 c.c. of water and an excess of lead acetate solution (10 per cent.) added to precipitate phosphites—5 c.c. is usually sufficient; the solution is made up to 50 c.c., well shaken, and allowed to stand until the supernatant liquid is quite clear (usually about one hour). 10 c.c., representing 0·5 Gm. of the salt, is carefully pipetted off, 50 c.c. N/1 $K_2Cr_2O_7$ and 10 c.c. sulphuric acid added, and the mixture heated on the water-bath; at the end of an hour the solution is cooled and diluted to 250 c.c. with water. The excess of dichromate is then determined on 50 c.c. of this solution by titration with N/10 $Na_2S_2O_3$, after addition of potassium iodide. The hypophosphorous radicle is completely oxidized to phosphate by absorbing two atoms of oxygen according to the equation :—

$$R'PH_2O_2 + O_2 = R'H_2PO_4.$$

The error due to the bulk of the lead precipitate is negligible; in several experiments, where the precipitate appeared bulky, it was separated by centrifuging, and in no case did it occupy more than 0·05 per cent. of the volume of the liquid.

Phosphites are determined, if necessary, by repeating the above process but omitting the treatment with lead, and the difference between the amounts of dichromate reduced calculated into phosphite. One atom of oxygen only is required for the complete oxidation of the phosphite radicle.

$$R'_2HPO_3 + O = R'_2HPO_4.$$

We have examined a number of commercial samples of hypophosphites from various sources with the following results :—

Calcium Hypophosphite

No.	Per cent. $Ca(PH_2O_2)_2$.	Per cent. Moisture.	Remarks.
1 . . .	95·95	0·05	
2 . . .	98·0	0·1	Traces of sulphates usually present.
3 . . .	97·05	0·1	
4 . . .	99·55	0·05	
5 . . .	99·75	0·1	
6 . . .	99·65	—	

Sodium Hypophosphite

No.	Per cent. $Na \cdot P_2H_2O_2$.	Per cent. Moisture.	Remarks.
1 . . .	84·5	11·15	
2 . . .	85·8	10·45	
3 . . .	94·5	5·35	
5 . . .	86·7	7·1	Na_2HPO_3 5·1 p.c.; Na_2SO_4 0·5 p.c.; Na_2CO_3 1·3 p.c.; Total 100·7 p.c.
5 . . .	87·15	10·35	
6 . . .	88·9	11·1	
7 . . .	90·8	7·4	Phosphite mere trace.
8 . . .	91·7	5·7	

Potassium Hypophosphite

Two samples examined contained 94·5 per cent. and 99·5 per cent. KPH_2O_2 respectively.

Hypophosphorous Acid

No.	Per cent. H_3PO_2 by $K_2Cr_2O_7$.	Total Acidity Calculated to H_3PO_2.	Difference Calculated to H_3PO_3.	
1 . .	31·5	33·12	1·00	Sulphates and chlorides absent.
2 . .	32·93	33·33	0·25	
3 . .	31·99	32·83	0·52	

In removing the phosphite from the acid it is necessary to neutralize with soda before adding the lead acetate. Lead phosphite appears to be fairly soluble in hypophosphorous acid, but lead hypophosphite is rather insoluble, and readily precipitates in the form of pearly white scales.

MANGANESE HYPOPHOSPHITE.

	Per cent. $Mn(PH_2O_2)_2 \cdot 2H_2O$.	Remarks.
1 . .	98·98	Calcium, sodium, chlorides, and sulphates—absent.
2 . .	92·71	$Na \cdot PH_2O_2$ 7·0 per cent. Chloride, sulphate faint traces.
3 . .	89·9 ($-PH_2O_2$ estimated). 89·3 (Mn estimated).	KCl 8·5 per cent. Loss on drying at 100° C. 0·4 per cent.
4 . .	Not determined.	$Ca(PH_2O_2)_2$ —18·1 per cent. Chlorides, sulphates, absent.
5 . .	103·1 ($-PH_2O_2$ estimated). 102·9 (Mn estimated).	Chlorides, sulphates, absent. Partially dehydrated.
6 . .	103·1 ($-PH_2O_2$ estimated). 103·5 (Mn estimated).	Partially dehydrated.

In no case did the phosphite amount to more than a trace.

The manganese was determined in the case of samples free from calcium by oxidizing with potassium chlorate and hydrochloric acid, adding ammonium chloride and precipitating manganese ammonium phosphate ($MnNH_4PO_5$) by the addition of ammonia to the boiling solution, filtering off, igniting, and finally weighing as manganese pyrophosphate ($Mn_2P_2O_7$). The calcium present in sample No. 4 was estimated in the following manner: 5 Gm. was dissolved in dilute hydrochloric acid, and ammonium chloride and ammonia added; the solution remained clear, showing absence of appreciable quantities of phosphate. The bulk of the manganese was removed by precipitation as sulphide and the calcium in the filtrate (which was red) precipitated by ammonium carbonate in the presence of a large amount of ammonium chloride. The precipitated calcium carbonate was well washed, dissolved in acetic acid, and reprecipitated as oxalate, being finally weighed as sulphate.

FERRIC HYPOPHOSPHITE

No.	Per cent. $Fe(PH_2O_2)_3$.	Remarks.
1	80·3	14·1 per cent. Na_2SO_4
2	90·98	$Fe(PH_2O_2)_2$ 4·83 per cent.
3	73·7	26·0 per cent moisture.

In the case of the iron salts we have been unable to devise a

satisfactory method of removing phosphite, so that in the above results it is included in the amount of hypophosphite found. The iron was determined by dissolving in sodium citrate solution and precipitating with excess of caustic soda, when the ferric hydroxide may be filtered off and weighed as Fe_2O_3, or dissolved in hydrochloric acid, and titrated with potassium iodide and thiosulphate. The iron was also estimated by the method used for total iron in the ferrous salt (see below) with concordant results.

The hypophosphite radicle was estimated by oxidation with dichromate as above, but with this difference, the lead treatment was omitted and the excess of dichromate titrated against a decinormal solution of ferrous ammonium sulphate.

FERROUS HYPOPHOSPHITE

	Per cent. Fe $(PH_2O_2)_2$.	Per cent. Fe $(PH_2O_2)_3$.	Remarks.
1 . .	33·76	47·82	$NaPH_2O_2$ 6·71% Na_2SO_4 7·23%
2 . .	44·99	24·37	$Ca(PH_2O_2)_2$ 22·65% Sulphates absent.

This is a very unsatisfactory salt, consisting as it does of varying quantities of ferrous and ferric salts. Total iron was found by oxidizing with potassium chlorate and hydrochloric acid, subsequently reducing the whole of the iron to the ferrous state by means of stannous chloride, the excess of which was removed by the addition of mercuric chloride, and the iron then titrated with N/10 $K_2Cr_2O_7$, using potassium ferricyanide as indicator. Ferrous iron was next determined by dissolving the salt in hydrochloric acid and pouring the solution into a large excess of hot mercuric chloride solution; calomel was precipitated and the hypophosphite oxidized to phosphate; the ferrous iron was then titrated with N/10 $K_2Cr_2O_7$ as above.

The accuracy of this method was proved by check experiments on mixtures of ferrous sulphate with sodium hypophosphite and a ferric salt, and as shown below the results obtained were correct:—

(1) 20 c.c. $FeSO_4$ + 0·25 Gm. $NaPH_2O_2$ = 19·8 c.c. N/10 $K_2Cr_2O_7$
(2) 20 c.c. $FeSO_4$ + 0·25 Gm. $NaPH_2O_2$ = 19·9 c.c. N/10 $K_2Cr_2O_7$
(3) 20 c.c. $FeSO_4$ + 0·25 Gm. $NaPH_2O_2$ + 0·1 Gm. $FeCl_3$
= 19·9 c.c. N/10 $K_2Cr_2O_7$

(4) 20 c.c. $FeSO_4$ + 0·25 Gm. $NaPH_2O_2$ + 0·5 Gm. $FeCl_3$
= 19·9 c.c. N/10 $K_2Cr_2O_7$
Blank 20 c.c. $FeSO_4$ = 19·9 c.c. N/10 $K_2Cr_2O_7$

Oxidation with dichromate and subsequent titration of the excess with ferrous ammonium sulphate was carried out as in the case of the ferric salt, the result in this case indicating hypophosphite + ferrous iron; the latter being known, the hypophosphite was obtained by difference.

We append the following list of factors with the hope that they may be of use:—

1 c.c. N/1 $K_2Cr_2O_7$ =
- 0·021273 Gm. $Ca(PH_2O_2)_2$
- 0·022014 Gm. $Na{\cdot}PH_2O_2$
- 0·026039 Gm. KPH_2O_2
- 0·016514 Gm. $H{\cdot}PH_2O_2$ (acid)
- 0·025382 Gm. $Mn(PH_2O_2)_2{\cdot}H_2O$
- 0·020917 Gm. $Fe'''(PH_2O_2)_3$
- 0·016264 Gm. $-PH_2O_2$ (radicle)

The above work has been carried out in the Analytical Laboratory of The British Drug Houses, Limited, to whom we are indebted for permission to publish the results.

Discussion

Mr. T. Tyrer said commendation of Rupp and Kroll's method was well deserved, but it required considerable care. Dr. Jowett's was a standard process; and it was undeniably useful and interesting that excess of lead could be disregarded. That was most important because of complaints concerning the deficiency of hypophosphites as such, but those making the complaints were seldom manufacturers, who had the knowledge or experience necessary to do justice to themselves, or to the difficulties of the process. He had been congratulating himself, as a manufacturer, upon the generally excellent results of a compound which gave a good deal of trouble, manganese hypophosphite. But he understood Mr. Hill to say it was evidently contaminated with the salts from the material which was used in its preparation. He asked Mr. Hill to look at the remarks which the authors had put in the table. Opposite No. 1 it said, "Calcium, sodium and sulphates—absent." In the next there was not very much, but there was a working down from 98 per cent. to 92 per cent. That was a subject for criticism. Of chlorine and sulphate there were faint traces; loss on drying 0·4 per cent. That appeared fair criticism, but it had nothing to do with the materials from

which the manganese hypophosphite might have been made. He was glad to see observations with regard to ferric hypophosphite recorded with precision. Criticisms on these salts were abundant, without regard to the facts concerning their preparation. If those who made the criticisms had been chemists they would have seen the difficulties. The paper was extremely interesting and informative.

Dr. H. A. D. Jowett asked whether check experiments had been made using pure sodium or calcium hypophosphite to which known amounts of lead acetate had been added. If the presence of lead did not interfere with the reaction, the method would be a valuable one.

Mr. C. A. Hill replied that the removal of the excess of lead being unnecessary in this process was the essential feature and had accordingly occupied closely the attention of the authors. It was one respect in which the method was more expeditious than the process of Dr. Jowett. In answer to Mr. Tyrer, he imagined that the authors would justify their generalization as to the contamination of commercial manganese hypophosphite by reference to sample No. 2, which contained 7 per cent. of sodium hypophosphite; sample No. 3, which contained 8·5 per cent. of potassium chloride, and sample No. 4, which contained 18 per cent. of calcium hypophosphite.

POWDERED RHUBARB

By E. T. Brewis, F.I.C., and H. Deane, B.Sc., F.I.C.

This investigation was undertaken at the suggestion of Professor Greenish for the purpose of discovering what is a fair standard of extractive if it be decided to follow the example of many Continental Pharmacopœias and insert such a requirement in the forthcoming British Pharmacopœia, and also to investigate the quality of the powdered rhubarb at present being sold. Samples were obtained from wholesale and retail dealers, and samples ground by Messrs. Stafford Allen & Sons have also been examined.

The determination of moisture was made by drying 5 Gm. in a flat-bottomed, stoppered weighing-bottle, placed in an air oven, which was maintained at a temperature of 100° to 105°C.

It was found that the loss of moisture proceeded at an irregular rate, and the operation was tedious, as prolonged drying was necessary in order to obtain approximately correct weights.

Attempts were at first made to effect the drying in a water oven, but these were soon abandoned, because the maximum temperature in this form of apparatus rarely, if ever, exceeds 98° C., and satisfactory weighings could not be obtained in less than forty-three to forty-five hours.

The determination of alcoholic extract was carried out in the following way, the method being that of the German Pharmacopœia :—

Five Gm. of the air-dry powder was macerated for twenty-four hours in 50 c.c. of dilute alcohol (50 per cent. by volume) ; 20 c.c. was filtered off and evaporated in a shallow, flat-bottomed nickel dish, and finally dried at 105° C. ; this took about twenty hours.

The ash was obtained by incinerating 1 Gm. in a shallow platinum dish placed in a muffle heated to dull redness, with free admission of air ; this occupied from twenty to thirty minutes. No examinations was made of the ash, but each sample was treated with dilute hydrochloric acid, in which, with the following exceptions, they were almost entirely soluble. Nos. 27, 37, 42 and 43 gave small, sandy, insoluble residues, and the residue of No. 11 was brown and flocculent, not sandy.

Microscopical Examination.—It is very satisfactory to note that none of the samples showed evidences of adulteration. Several contained occasional fragments of sclerenchymatous fibres ; these were also to be found in some of the specimens ground by Stafford Allen & Sons, and probably are derived from the fragments of string that are sometimes left in the pieces. No. 18 was the only sample showing an appreciable proportion of extraneous matter. It contained sclerenchymatous fibres, sclerenchymatous cells, coniferous wood tracheids, and one fragment of a leaf was found. The proportion of these was not large enough to constitute adulteration, but rather indicated careless contamination. The colour, aroma and yield of extractive also mark it as a very inferior specimen, and it is satisfactory to think that it came from a " medical herbalist " and not from a pharmacist.

We have not had the opportunity of searching the literature of the subject, but as the following points are not mentioned in Greenish and Collin's *Vegetable Powders*, nor in one or two other works we consulted which touch on the histology of rhubarb, we think it a matter of interest to draw attention to them, although doubtless that has been done before. The first is that rhubarb

does not contain any lignified tissue. It contains vessels with thickened walls, but these will not stain with phloroglucin or other reagents for lignin, so that anything in powdered rhubarb stained red by phloroglucin may be put down at once as foreign matter. The second point is that all the samples of powdered rhubarb examined contained gelatinized starch grains. In most specimens they were easily found, though the proportion was not large, others contained a large number, while in others again careful search was necessary to discover them, but they were discoverable in every case. The proportion seemed to have no connection with the quality, No. 18, the worst sample examined, contained large numbers ; in No. 10, also a poor sample, they were difficult to find.

The explanation of their presence is not obvious, one would naturally put it down to the use of excessive heat in drying, but according to the travellers quoted by Hosseus (*Archiv. der Pharm.*, 1911, **249,** 419), Chinese rhubarb is not dried by artificial heat, moreover, English rhubarb, which has certainly never been in any temperature that would gelatinize starch, shows the same phenomenon. Possibly the change in the grains is caused by enzymes, which get a chance of acting during the necessarily slow drying of the fleshy rhizome.

With regard to the use of turmeric as an adulterant of rhubarb, although fresh tests for it appear in foreign papers at frequent intervals, we are inclined to think that, as far as England is concerned, this is unknown. Inquiries made of men with forty or more years of varied experience of drug grinding failed to discover any knowledge of it, and those asked had no reason to conceal such knowledge if they had it. None of the samples examined were so sophisticated.

Table I gives the results of examination of the bought samples. Nos. 1 to 4 were from English wholesale houses. Nos. 5 to 11 were samples of different grades obtained from a German wholesale firm of high reputation. The terms 3/4 mundata and 1/2 mundata refer to the degree in which the root has been peeled, 1/1 mundata being the finest quality, completely free from the external tissues, 3/4 mundata and 1/2 mundata indicating less perfect peeling. No. 00 is stated to be made from selected pieces of red fracture ; No. I from whole pieces ; No. II from the best fragments left from sawing the pieces up into the small cubes, a favourite German form of using the drug ; and No. III from the best dust produced in the same process.

TABLE I

No.	Description on Label.	Moisture.	Ash of Air-dry Drug.	Ash of Dry Drug.	Alcoholic Extract of Air-dry Drug.	Alcoholic Extract of Dry Drug.
1	Pulv. Rhei	9·43	11·20	12·37	36·19	39·96
2	Pulvis Rhei Elect. from selected Chinese	8·80	11·50	12·61	37·37	40·97
3	Pulv. Rhei Opt.	11·34	8·62	9·72	34·80	39·25
4	Pulv. Rad. Rhei E.I. Elect. .	9·40	11·42	12·61	41·35	45·64
5	Rhizoma Rhei, P.G. 5, Sin. Shensi, pulv. subt. Nr. 00 .	8·36	13·04	14·23	41·65	45·45
6	Rhizoma Rhei, P.G. 5, ¾ mundata, Shensi, pulv. subtilis Nr. I	9·38	7·46	8·23	46·16	50·94
7	Radix Rhei P.G. 5, Sin., Shensi, pulv. subt. Nr. II . . .	12·32	9·62	10·97	34·46	39·30
8	Radix Rhei P.G. 5, Sin., Shensi, ¾ mundata, pulv. subt. Nr. III	12·57	7·76	8·87	35·28	40·35
9	Radix Rhei, P.G. 5, Sin., Shensi ¾ mundata, pulv. gross I .	13·40	12·28	14·18	40·60	46·80
10	Radix Rhei, Sinensis Shensi, ½ mundata, naturalis, pulv. gross	13·23	11·28	13·00	29·30	33·77
11	Radix Rhei, P.G. 5, Sin. Shensi, ½ mundata, naturalis, pulv. subtilis	9·75	10·12	11·21	35·82	39·69
12	Powdered Rhubarb (East Indian)	8·74	7·94	8·70	41·85	45·86
13	Best Powdered Rhubarb . .	8·93	8·32	9·14	42·49	46·66
14	Pulv. Rhei Opt.	11·64	10·22	11·57	38·28	43·32
15	Powdered Rhubarb . . .	8·00	12·10	13·15	40·53	44·05
16	Powdered Rhubarb . . .	8·50	7·08	7·74	42·88	46·87
17	Pure Rhubarb Powder. . .	13·36	6·88	7·94	32·70	37·74
18	Rhubarb	13·64	9·28	10·75	28·20	32·66
19	Finest Powdered E.I. Rhubarb, generally known as Turkey Rhubarb	—	—	—	—	—

Nos. 12, 13 and 14 come from high-class pharmacies; Nos. 15 and 16 from limited company drug stores, and Nos. 17, 18 and 19 from unqualified dealers. In the case of No. 19 the quantity bought was insufficient for more than the microscopical examination.

Table II gives the results of the examination of samples ground by Messrs. Stafford Allen & Sons. Of these, Nos. 42, 43 and 44 are English, the remainder being Chinese. No. 43 is a cheap quality made from trimmings, which accounts for the high ash. Nos. 34, 35, 36, and 37 are interesting, as they

all came from the same cases. The pieces were sorted into three lots according to colour, and all dark portions chopped out. No. 34 is the best, 35 the second, 36 the third quality, while No. 37 is the trimmings.

The ash and extract were determined on the air-dry drug, but the calculated figures for the powders dried at 100° to 105°C. have been added for comparison. Although perhaps in some ways not so convenient, it seems to be a more satisfactory method, when standards of this type are included in a pharmacopœia, to base them as the dried and not the moist drug.

The conclusions to be drawn from the figures presented is that the limit of ash of 12 per cent. on the air-dry drug suggested by

TABLE II

No.	Description.	Moisture.	Ash of Air-dry Drug.	Ash of Dry Drug.	Alcoholic Extract of Air-dry Drug.	Alcoholic Extract of Dry Drug.
20	Pulv Rad. Rhei. E.I. . . .	10·91	9·36	10·51	35·14	39·44
21	Pulv. Rad. Rhei, E.I., good colour	13·96	7·70	8·95	29·78	34·61
22	Pulv. Rad. Rhei, E.I. . . .	11·32	8·54	9·63	37·82	42·65
23	Pulv. Rad. Rhei, E.I. . . .	12·96	9·10	10·45	31·82	36·56
24	Pulv. Rad. Rhei, E.I., super .	11·63	7·68	8·69	41·59	47·06
25	Pulv. Rad. Rhei, E.I. . . .	11·82	9·06	10·28	33·81	38·34
26	Pulv. Rad. Rhei, E.I., No. 1 .	12·14	9·82	11·18	38·59	43·92
27	Pulv. Rad. Rhei, E.I. . . .	11·58	6·74	7·62	41·72	47·18
28	Pulv. Rad. Rhei, E.I. . . .	14·48	7·08	8·28	43·58	50·96
29	Pulv. Rad. Rhei, E.I. . . .	12·37	6·88	7·85	45·77	52·23
30	Pulv. Rad. Rhei, E.I. . . .	14·57	10·58	12·38	25·54	29·90
31	Pulv. Rad. Rhei, E.I. . . .	10·48	12·57	14·04	36·54	40·79
32	Pulv. Rad. Rhei, E.I., No. 120	11·73	7·76	8·78	32·10	36·37
33	Pulv. Rad. Rhei, E.I. . . .	11·36	9·04	10·19	36·08	40·70
34	Pulv. Rad. Rhei, E.I., A. . .	10·29	8·20	9·14	38·74	43·18
35	Pulv. Rad. Rhei, E.I., B. . .	8·98	8·98	9·86	41·48	45·51
36	Pulv. Rad. Rhei. E.I., C. . .	12·59	9·25	10·58	43·37	49·62
37	Pulv. Rad. Rhei, E.I., trimmings	10·34	10·28	11·47	34·28	38·23
38	Pulv. Rad. Rhei, E.I., Elect..	10·97	8·88	9·97	39·11	43·93
39	Pulv. Rad. Rhei, E.I., Opt. No. 1	9·79	9·52	10·55	39·53	43·82
40	Pulv. Rad. Rhei, E.I., Opt. No. 2	11·01	8·76	9·84	38·93	43·75
41	Pulv. Rad. Rhei, E.I. . . .	10·70	10·34	11·58	45·57	51·03
42	Pulv. Rad. Rhei, Ang. No. 1.	10·92	10·52	11·81	38·29	42·98
43	Pulv. Rad. Rhei, Ang. No. 2 .	10·17	18·04	20·08	33·69	37·50
44	Pulv. Rad. Rhei. Rhapontic No. 1	12·16	9·80	11·16	41·79	47·58

the Committee of Reference in Pharmacy will include nearly all the powdered rhubarb of commerce, but it is notable that the three samples (Nos. 5, 9 and 31) that it would exclude are in other respects good samples. For the extractive, the minimum of 35 per cent. on the air-dry drug demanded by the German Pharmacopœia seems to be reasonable. If the completely dry powder is to be taken as the basis of calculation, higher figures in both cases are demanded.

Our acknowledgments and thanks are due to Messrs. Stafford Allen & Sons, Limited, London and Long Melford, at whose expense and in whose laboratories this investigation has been carried out, also to W. W. Busby for assistance in experimental work.

Discussion

The President said the paper afforded useful data for the extractives of rhubarb for the Pharmacopœia. He was dubious about the ash figure being of much value. If one fixed it at 12 per cent., as some desired, then sample No. 5, which was one of the richest in extractives, would give an ash figure higher than was proposed. Mr. Brewis did not mention one of the light Canadian varieties, which was 4 per cent. It might be wise to take the figure for extractive, and perhaps unwise to take notice of the ash figure at all.

Mr. E. M. Holmes expressed his doubts as to the truth of the statement that in China no rhubarb was dried by artificial heat. Those who had examined any large quantity of rhubarb would agree that there was always some in which was a dark core which could only be produced by artificial heat. If gradual drying were carried out the rhubarb dried of a fairly good colour all through; but if dried too quickly the central part subsequently decayed. The Russians knew that very well, because the old Russian rhubarb, which came through Kiachta, always had a hole bored through to the centre, the reason being to see whether it was sound to the core, pieces with a dark centre being rejected. He concluded that, at all events, in some part of China the rhubarb was dried by natural warmth, but in others it was dried by artificial heat. He believed the term "high-dried" really meant that it was dried in that way, the term being an English one.

Mr. E. F. Harrison said the President had already spoken of the unwisdom of putting the figure 12 per cent. as ash limit in the

Pharmacopœia. He had had very good samples of rhubarb giving more than 12 per cent. of ash. A paper on the subject had appeared in Germany, which showed that the term "high-dried" did not refer to the temperature, but to the fact that the rhubarb was hung high in the drying rooms. The author spoke positively on that point.

Mr. H. Deane confirmed Mr. Harrison's remark. Hosseus in his paper was very emphatic on the point that "high-dried" referred to the root being hung high in the houses; it was not dried by artificial heat.

Mr. E. T. Brewis in reply said that it was practically impossible to dry rhubarb quickly by artificial heat. It was such a thick fleshy root that the drying must be gradual. The gelatinized starch grains were found in English rhubarb which was known not to have been dried at a temperature sufficiently high to gelatinize starch.

A NOTE ON THE ALLEGED POISONOUS PROPERTIES OF HONEY FROM DATURA STRAMONIUM

By Harold Deane, B.Sc., F.I.C.

The interest of this subject lies rather in its exemplifying the devious paths by which statements get into books of reference and the difficulty of stopping the spread of false information once it has got a start than in its intrinsic importance. On p. 773 of the nineteenth edition of the *United States Dispensatory* occurs the statement that honey collected by bees from *Datura Stramonium* is poisonous, and in Tschirch's *Handbuch der Pharmakognosie* (Band II., S. 10, 14) datura is included in a list of plants that afford poisonous honey. As at the time these paragraphs were noticed there was a considerable area of *Datura Stramonium* in bloom on Messrs. Stafford Allen and Sons' drug farms at Long Melford, in close proximity to several beehives, the matter seemed worthy of attention.

Inquiry showed that stramonium had been grown near the hives in previous years, and that no complaints of the honey had arisen. On examining the plants no bees were found visiting the flowers, and the structure of the flowers showed that they were not adapted for bees. The flowers are white, they have a long corolla tube, with the nectaries at the bottom, and first open in the evening, when their scent is much stronger than during the day. It is thus evident that they are adapted for pollination

by night-flying insects with long proboscides—the hawk moths. The tube of the corolla is almost closed by the style and the anthers, leaving just room for a proboscis, but not nearly enough to allow a bee to crawl down the tube. As the length of the proboscis of a hive bee is only 6 mm. and the length of the corolla tube of stramonium is from 55 to 65 mm., it is evident that it is quite impossible for bees to gather honey from the flowers. Certain species of bee have a habit of biting through the base of the corolla of some flowers to save themselves the trouble of pushing their heads past the stamens, but the hive bee does not do this, although it will use holes so made if it finds them. Moreover, the calyx of stramonium is inflated, and would render such biting through difficult, if not impossible, and all the cases recorded are of flowers which the bees know contain honey, because they have obtained it by visiting them in the usual way. Knuth's *Handbuch der Blutenbiologie*, the authority on the subject, gives no cases of flowers from wihch the bees are unable to obtain honey in the usual way, being bitten open. The same authority (*ibid.* II. Band, 2 Teil, S. 135, and III. Band, 2 Teil, S. 106) gives hawk moths and small beetles of the genus *Meligethes* as the only insect visitors to *Datura Stramonium*, while with regard to *D. Tatula*, which has a very similar flower, he says honey bees are unable to reach the honey, but when the flowers open late in the afternoon they take pollen from the mouth of the tube.

Having thus demonstrated to my own satisfaction that bees do not get poisonous or any other honey from *Datura Stramonium*, it seemed desirable to get to the source of the error. Tschirch gave "Flückiger" as his authority; the reference is apparently to Flückiger's *Pharmaceutische Chemie* (II. Auflage, 2 Teil S. 272) when it says "In 1879 *Datura* was charged with being the source of poisonous honey," but the authority for the statement is not given. The *United States Dispensatory* gave H. Bley, *Pharmaceutische Zeitung* (1885, **30,** Nov. 25). This volume is not in the Library of the Pharmaceutical Society, but I found in *The Pharmaceutical Journal* (1885 [3], **19,** 448) the following :—

"At the last meeting of the Beekeepers' Society in Dresden, Herr Bley, a pharmacist, brought forward the subject of poisonous honey, which, he said, had been several times imported from Trebizond. He attributed the noxious property to the growth of the *Datura Stramonium* in the district from which the honey was derived, and said that cases of illness, in one case followed by death, had been officially established."

This did not indicate the source of Herr Bley's ideas, so the *Pharmaceutische Zeitung* was procured, but the paragraph in *The Pharmaceutical Journal* turned out to be practically a translation of that in the German periodical, except that Herr Bley had been promoted from a "Drogist" to a pharmacist. I, therefore, asked a relative then living in Germany if he would assist by searching in a public library for a fuller report of Herr Bley's paper. He took the more direct course of writing to the President of the Dresden Beekeepers' Association [Bienenzuchter-Verein für Dresden und Umgebung]. The latter searched the minutes of the Association, and found that on October 25, 1885, Herr Bley had given, not an original paper, as one would imagine from the report in the *Pharmaceutische Zeitung*, but abstracts from various journals of matters of interest to beekeepers. The following is a translation of the one we are now concerned with :—

"Poisonous Honey.—In No. 34 of the *Droguen Zeitung*, of 1879, a report was made concerning poisonous honey, which the bees in the neighbourhood of Trebizond collect from the flowers of the Thorn Apple, which grows so freely there. The use of this honey is followed by fainting, vomiting, and delirium, and sometimes even by death." A search for the *Droguen Zeitung* of that date was unsuccessful, but a further search in the literature brought me to what is evidently the original source.

In *The Pharmaceutical Journal* ([3], **18,** 397–9) is a paper entitled "Notes on Trebizonde Honey," read before an Evening Meeting of the Pharmaceutical Society by J. C. Thresh. In the course of it he says : "Still more recently, Mr. A. Biliotti, H.M. Consul at Trebizonde, in his Report for 1879 (c. 2,331, p. 1,023), says that 'bees are reared on a somewhat large scale in the province of Trebizonde, but the honey produced is unfit for food." He also adds : "It is presumed that the poisonous principle contained in the honey is gathered from the flowers of the *Datura Stramonium*, which grows in abundance on the coasts. Beehives, therefore, are only remunerative for their wax."

Dr. Thresh examined a sample of this honey, which Mr. Biliotti had sent to England, and showed that there was no alkaloid in it, Dr. Stockman corroborating by showing that none of the extracts obtained from it dilated the pupil. He thus came to the conclusion that Mr. Biliotti's idea of its origin from *Datura Stramonium* was wrong, and supported the theory, which has since been fully confirmed, that *Azalea pontica* is the source of the poisonous honey from Trebizonde. In the discussion on the

paper, Mr. E. M. Holmes also pointed out that the flowers of stramonium are not adapted for the visits of bees.

In this connection, it may be noted that it does not necessarily follow that because other parts of the plant are poisonous the nectar secreted by the flowers is so. Honey bees visit the flowers of *Atropa Belladonna*, sometimes in large numbers, although they appear to prefer other flowers when they can find them, but no bad results from eating the honey from hives kept near the fields of belladonna at Long Melford have been reported.

Thus we see that a rash guess made by a British Consul, which was afterwards corrected, got into a German pharmaceutical periodical, from there to the Dresden Beekeepers' Association, thence to another pharmaceutical journal, and thence to an American book of reference, and is still flourishing after more than thirty years.

THE PRESIDENT said the meeting would thank the author very heartily for his paper. He was an eminent botanist, and was also the grandson of the first President of the Conference, and from that point of view he had an association with the past which must be very pleasant to all.

TABLET MAKING FOR THE RETAILER

By P. G. CHAMBERLAIN, M.A.

During the past few years the growing popularity amongst practitioners of prescribing remedies in tablet form, together with the rapid falling into disuse of the old-fashioned pill machine, must have prompted a few progressive dispensing chemists to have their own small plant for the manufacture of tablets, instead of importing them from their wholesale house. The following table shows the proportion of tablets to pills and wrapped powders used in the author's establishment between July 1, 1912, and June 30, 1913 :—

TABLETS.		PILLS.		POWDERS.
Sugar-coated. Purchased.	Plain. Home-made.	Sugar-coated. Purchased.	Plain. Home-made.	Wrapped.
8,082	127,117	27,564	872	1,944

As will be seen from these figures the proportion of made tablets to made pills is 145 to 1, and therefore it is not surprising that, taking the above figures into consideration, one is tempted to make a special study of tablet making. Of course, these results are simply the outcome of educating the medical profession up to the advantages of tablet prescribing, and pointing out repeatedly their scientific manipulation over pills. The lack of knowledge of tablet making among retailers in this country is nothing short of remarkable, and in consequence of this there is no demand for apparatus on a small scale (the only tablet machine made of any real use hailing from America), whilst any additional article required, such as a hot water plate, has to be designed by the pharmacist himself. Even so, not only are the advantages of tablet-making over pill-making almost too numerous to mention, but also a course of tablet-making affords to an apprentice absolutely and without exception a better training in judgment, manipulation, and common sense than any other operation in pharmacy.

Here are a few points by which tablets score over pills :—

1. Made by a more scientific and hygienic method, ensuring more accurate dosage.
2. Enormous saving of time and labour, necessary for modern speeding-up conditions.
3. Fairer to the apprentice, who can devote more time to studying other preparations.
4. Drudgery and obsolete methods eradicated from the dispensing counter.
5. Popular form of administering medicine with doctors and patients alike.

The following notes, strictly for the busy dispensing chemist, will deal only with the making of plain tablets for internal use (sugar coating being quite outside the domain of retail pharmacy). Simplicity, rapidity, and economy should be the watchwords of the man who makes his own tablets.

Apparatus Required

1. Three mortars and pestles, knives, scales, as found on every dispensing counter.
2. Two sieves with oak frames, preferably round, about 18 in. in diameter. Either brass or iron meshes may be used (No. 20 mesh). Keep the brass sieve for white powders

and the iron one for coloured powders. The latter sort seems to be the most durable.

3. Hot-water table for drying the granules (described hereafter).
4. Small hand-power machine, which can be screwed on to any table of convenient size and height. Four sets of punches $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{3}{8}$ in., and $\frac{1}{2}$ in.
5. A shelf close to, holding the following :—Powdered gum, ordinary starch, powdered sugar, sprinkler can for French chalk, 90 per cent. spirit, spirit and water (equal parts), and syrup.
6. Tablet note-book.

As it is the aim of the writer to keep the process as simple as possible, no other agents whatever are used other than those mentioned above. Several curious concoctions have been suggested from time to time, such as theobroma emulsion, etc., but their use only leads to complications—*e.g.*, the use of theobroma emulsion gives a tendency to picking, and does not lend encouragement to the tablet maker.

Classification of Tablets According to Method of Procedure

1. *General Method*, by adopting the usual formula for granulation, lubrication, and disintegration. As by far the greatest number of tablets are made by this method, a detailed description of it will be given.
2. *Direct Compression*, *e.g.*, urotropine, calcium lactate.
3. *Direct Heat Method.*—Without granulation by the wet way. Tablets containing resinous substances come under this head.

1.—General Method

Descriptions of this method having already been published, many details have been omitted, and the following should only be regarded as merely notes on the process.

A.—Calculate Formula with Respect to Size, Shape, Weight, and Correct Die

First of all, after settling which size die will suit the tablets, one must find out by experiment the amount of diluent that must be added to each lot, so that the tablet will be of correct thickness. Nothing looks so bad as a tablet as thick as it is broad or as thin as a wafer. To save time in calculating the amount of diluent

it is best to weigh a few of some similar tablets that one has in stock, and their weight noted, which affords a rough estimate of the amount of diluent required. Having got so far, the correct weight of the finished tablet must be calculated and entered in the book like the following in the case of calomel tablets.

Size.	Gr. $\frac{1}{10}$.	Gr. $\frac{1}{6}$.	Gr. $\frac{1}{4}$.	Gr. $\frac{1}{2}$.	Gr. 1.	Gr. 2.
Calomel . .	10	16½	25	30	100	200
Sugar . . .	35	40	40	35	40	75
Starch . . .	15	15	15	55	15	25
Talc . . .	3	3	3	3	5	10
Size of Die. .	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	¼ inch
Weight of 10 tablets (approx.) . .	10=6 gr.	10=7 gr.	10=8 gr.	10=10gr	10=15gr	10=30gr.
No. of Tabs .	100	100	100	100	100	100

Granulate with equal parts of spirit and water.

In calculating the weight of the finished tablet allowance must be made for traces of moisture present in the ingredients, especially starch, whilst if a batch is granulated with syrup the resulting tablets should be slightly heavier than the formula shows.

B.—Weighing and Mixing

The ingredients are weighed out according to formula and mixed in a mortar in the usual manner, taking care that the latter is plenty large enough. It is important that the substances should be in the finest possible powder and thoroughly mixed; in some cases where the colours are contrasty they should be well pulverized beforehand, otherwise a speckled tablet will result (which is a veritable eyesore). Powdered sugar must also be ground down separately when mixed with a coloured powder, such as rhubarb, if not, a multi-coloured tablet will result. The adhesive, which is not often required (5 per cent. powdered gum), and the disintegrator (5–15 per cent. starch) are mixed in at this stage. Sieving the mixed powder is superfluous so long as it has been thoroughly treated in the mortar.

C.—Granulation

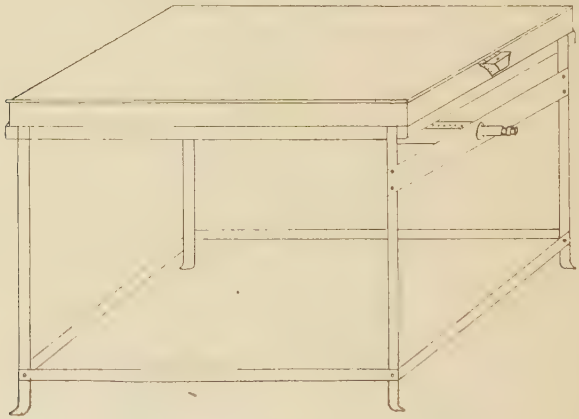
The liquid used for granulating is in almost every instance a

mixture of equal parts of water and spirit or a little spirit alone. Have a sieve ready by the side of the mortar, and under it a sheet of thick paper ready for receiving the granules. The addition of the granulating liquid requires special care, for a drop too much often will spoil a batch, owing to the mass becoming too wet and clogging the sieve, especially if hygroscopic substances are present such as powdered extract of hyoscyamus. The addition of spirit to the liquid lessens this danger, as it soon evaporates, and the mass, if too wet, perhaps rights itself, and after waiting a short while becomes sievable. In some cases syrup alone, or thinned down with a little water, may be used with advantage for granulating purposes. It is very easy for the novice to overshoot the mark in adding the granulating liquid, when one either has to start all over again or transfer the wet mass to dry on the hot plate, and then powder it down again ready for sieving. Most substances pass through the sieve easily by being worked through with the fingers ranging from vegetable powders, which go through nicely, to substances like quinine and acetyl-salicylic acid, which are liable to clog the sieve badly if a shade too moist. Indeed, if large quantities of these substances, *e.g.*, 2 lbs. acetyl-salicylic acid, have to be granulated, it is the most expedient way to moisten the mass in the mortar as usual to clinging point, and then transfer direct to the hot plate, and when dry gently break up the caked mass and push carefully through the sieve with the fingers. Some substances on being sieved do not yield good granules, and one finds a large proportion of powder mixed with the granules ; but this is not found to interfere with the compression and feed so long as the amount of powder is not too big. If this is so it will soon be apparent by the feed becoming irregular or the tablets breaking, due to either an overcharge or absence of interlocking power of the granules.

D.—Drying

The sifted granules are now transferred on their sheet of paper to the hot table. Until recently the granules were dried by us in a very primitive manner ; either spread on a ledge over the hot water pipes or with larger quantities placed on an iron plate supported on bricks over a ring burner. This method was on more than one occasion disastrous, owing to the granules getting burnt, due to the uneven distribution of the heat ; and also a constant watch had to be kept on them. The following is a

description of a *hot table*[1] which has been specially made from the design of the writer. It is simply a long shallow enclosed copper bath supported on iron legs; underneath it runs a long gas burner capable of fine adjustment. The tank is filled about half full with water and then heated; in about fifteen minutes the copper surface is quite hot. Now the various batches of granules that are to be dried are spread out on their respective sheets of paper and placed on this hot table. In order to save time it is advisable to wait until several lots of tablets want making, and then they can be granulated one after the other and all dried together, the hot plate being large enough (48 ins. × 20 ins.) for receiving several lots. This mode of drying granules has proved of immense value, for now three or four batches of



granules may be dried, without any watching or risk of burning, in one hour or less.

Drying granules by exposure to the air in a room without the aid of artificial heat is tedious and uncertain; exposure to the sun on a hot day may be theoretically excellent, but in practice the wind may blow the granules about and they may get contaminated with smuts and take hours to dry. The only two substances which are affected by the heat of the hot table when the water is nearly boiling are acetyl-salicylic acid and a mixture of rhubarb and soda. The former is apt to melt and to part with acetic acid, which can be smelt coming off if allowed to get too hot. With the latter a reaction takes place, and the colour changes to

[1] Made by Brown and Son, Charlotte Street, N.

very dark brown, whilst if the temperature is kept low, *i.e.*, so that the hand can be kept on the plate comfortably, the granules keep their rich red colour and form excellent tablets. The hot table should be placed preferably in a corner close to the machine and gas supply.

E.—Lubrication

Lubrication is affected simply and solely by French chalk or talc, which for convenience is kept in a large sprinkler top container. Talc is now sprinkled over the dry granules on the hot table and then they are tipped into a large dry wide-mouthed bottle and thoroughly shaken up. The use of too much lubricant should be avoided, as it gives to most tablets a very shiny, artificial look, as if they were composed of talc and nothing else. Usually 3 per cent. is sufficient, but many substances require about 5 per cent. Very often when doing a batch of substances like quinine or quinine salicylate they become very obstinate when being compressed, whilst the addition of another 1 per cent. of talc makes matters run quite smoothly. It must be borne in mind that the amount of lubricator added must vary with the nature of the granulated substance, many vegetable powders requiring very little, and other ingredients acting as lubricators themselves.

Finally, the talced granules are sieved through one of the No. 20 sieves in order to break up any stray lumps that remain; but this operation may be neglected if a very small batch is being made, merely pressing the granules between the paper being sufficient.

F.—Compression

Directions for putting in the dies and punches and general tuning up of the machine are usually sent by the makers. When these are in place and before screwing on the shoe is the moment for roughly adjusting the lower punch, so as to receive the correct weight of the substance and also for adjusting the compression by turning the upper punch up or down, as the case may be. Having put some of the granules on the platform of the machine, fill the die with some, taking care that the punch is as low as it will go, and revolve the wheel cautiously, making the necessary adjustments. Turn out a few tablets in this manner until the correct weight of five or six is obtained. In this way the correct weight is roughly ascertained. Be sure to adjust the bottom

punch so that it is exactly flush with its die at the top of the stroke, otherwise the shoe (which is made of soft white metal so as to reduce damage to the punches to a minimum) may get grooved if the punch is too high. If the punch is too low the tablets are chipped as they are kicked off. Now screw on the shoe and fill it with the dry lubricated granules, and then finally check the weight of the tablets by turning off a few at speed. Make the necessary adjustments and see that all nuts are tight and everything is now ready for compression.

This is the critical moment of the whole process, especially when trying new formulæ, the operator wondering if they will "go all right." One can always tell after the first dozen or so have been compressed if they are going well; otherwise by this time a bad lot will have begun to scrape and go wrong generally. The resulting tablets will now chiefly depend on the correct degree of compression. With a 5-grain tablet there should be just a moderate resistance felt when the machine handle is turned at the rate of about 90 r.p.m. With a large tablet, say, of 10 grains, the resistance should be proportionately greater; whilst for a 1-grain tablet it should be scarcely perceptible. The tablets should also be tested by breaking between the fingers and also observing their appearance. As the tablets are kicked off the platform by the shoe they should be collected in a tray with fairly deep sides, so as to prevent any of them being scattered on the ground. Finally they should be sorted through, and any faulty ones picked out. They should then be transferred to wide-mouthed stoppered bottles, properly labelled, and placed on a shelf specially kept for tablets. Sometimes when making a large batch—say 1 lb. of 1-grain calomel tablets, which means perhaps an hour's wheel turning at 100 r.p.m.—the pressure may become slightly altered, due to the vibration of the machine causing a slight alteration to the bottom adjustment mechanism. One should therefore slow down occasionally and notice the resistance when the wheel is turned slowly, or weigh a few tablets periodically and check their weight.

Causes of Trouble

"Picking" and "capping" are said to cause a lot of trouble, but these faults have been grossly exaggerated; even if they do occur, they are so easily remedied that they cause no anxiety to the operator; indeed, a little more talc or a slight alteration of pressure is all one need have resort to. The writer has never

been seriously troubled with these complaints. There is, however, a fault of another description, which, unfortunately, does occur; and when it does, nothing will remedy it, unless it is simply due to scanty lubrication. It may be described as a scraping or screeching noise caused by the substance being stuck in between the bottom die and punch. The consequence is the punch sticks in its die, and can only be moved by jerking the wheel, putting a strain on the machine, but at the same time ejecting a fair tablet if the wheel is turned slowly. This trouble may take place without warning, and is especially prone to happen with a few certain substances. It has been found to take place with granular sodium citrate if compressed direct, and also with a mixture of phenacetin, caffeine, and acetyl-salicylic acid and a few other chemicals of similar nature. There seems to be no remedy; extra talc makes matter worse, and all one can do is either to proceed slowly at the rate of about twelve a minute or try over again. The cause of this trouble is rather hard to locate, but may be due to the nature of the chemical which is being compressed, for it cannot be traced to faulty granulation or insufficient drying.

Method 2.—Direct Compression

Besides the well-known chemicals that can be treated in this way, such as formamine, potassium bromide, etc., the only one needing comment is calcium lactate. This salt can be obtained in powder, lumps, or small acicular crystals, and so samples should be obtained, and the one selected which affords the nicest granules. Add the usual percentage of starch and French chalk and compress into tablets. If the ordinary powdered salt is used and granulated by the general method, unsightly rough grey-looking tablets are formed.

Method 3.—Direct Heat

Under this heading come all tablets containing a large proportion of resinous substances, such as scammony, aloes, podophyllin, etc. If these are treated as in Method 1, on granulating an unworkable sticky mass is formed, which will not go through the sieve, even if moistened only with a few drops of 90 per cent. spirit; not only is it a very difficult and tedious process to get a correctly moistened mass for the sieve, but even then sticky lumps are formed, and more often than not a failure results.

Procedure.—Tablets prepared by this method usually require

a diluent, and for this starch is by far the best; sugar is apt to melt easily and to char. To begin with, place the powders and diluent (well mixed) on a piece of thick paper ready for heating. Have ready an iron plate about 12 ins. by 12 ins. supported on legs (an ordinary hot plate found in any chemical laboratory answers the purpose), the plate itself being about ¼ in. thick. Light the burner under the plate and wait about ten minutes until it is quite hot; then place the powder on the hot plate and stir well with a pill knife, and the powder at once becomes granular due to the action of heat on the resins. If the plate is very hot the powder should only be allowed to remain thereon a few seconds. Now after removing the granules from the source of heat, shake them carefully through one of the sieves; if there are any lumps, help them through by very light pressing with the fingers so as not to crush the granules to a powder. Now they are weighed and the weight of the tablet calculated, then they are talced and compressed.

The following formula shows the utility of this method:—

Scammony	40 grains
Ext. Aloes	30 grains
Grey Powder	24 grains

Make into 24 pills.

This prescription for pills is often presented to be dispensed, and however these pills were made, on keeping a week or so, shrunk into all sorts of shapes like dried peas, much to the concern of the patient and disappointment of the chemist. Consequently, after an explanation to the patient they were made into tablets by this method, and the result was excellent, both in appearance and keeping qualities; in addition, the time taken to make an ounce of these tablets was less than that taken to make twenty-four pills. Forty grains of starch were added to every twenty-four tablets as a diluent.

Examples of Formulæ

Sodium Citrate, 2 Grains.—Many substances look at first sight as if they might be compressed direct. Granular sodium citrate as obtained from the wholesaler certainly does, but on trying these granules in the machine, even after lubrication, rebel at compression. Codeine phosphate is another substance that behaves like this. This is due to the very soft nature of the granules, and as they have no cohesive or interlocking power are simply squashed into a sticky, easily breakable tablet. As

ordinary sodium citrate contains a large amount of water of crystallization, it is as well to use the exsiccated salt, and therefore allowance must be made in the weight of the salt taken so as to be equivalent to the hydrated salt, and the finished tablet will only weigh about 1½ grains.

With these tablets the general method should be followed, granulating with a little syrup and adding about 5 per cent. of talc. By proceeding thus a satisfactory tablet is produced. As these tablets are usually crushed up on being used, they should be compressed as lightly as possible.

Dover's Powder, 5 Grains.—An example to show how formulæ may be adapted for tablets without interfering with their therapeutic effect, thus :—

Opium, in finest powder	50 grains
Ipecac., ,, ,, ...	50 grains
Sugar ,, ,, ...	400 grains
Starch	35 grains
Talc	15 grains
	550 grains

Make 100 tablets : each tablet to weigh 5½ grains.

The potassium sulphate, being gritty and of no therapeutic value, is omitted, and enough sugar added to make a suitable tablet. In making these tablets the general method was followed, particular attention being paid to rubbing down the opium and the sugar so as to prevent the formation of a speckled tablet.

Substances of the nature of quinine sulphate, quinine salicylate, etc., sodium citrate, codeine phosphate, morphine salts, etc., require an increased amount of adhesive and an extra percentage of talc, about 5 per cent. or more, till they run smoothly.

All small tablets containing a large proportion of powdered extracts, such as belladonna, hyoscyamus, aloin, require very careful granulation, a few drops of 90 per cent. alcohol generally being sufficient.

Time Involved in Tablet Making

When the pharmacist is once well acquainted with the process of tablet making he can see at a glance, when a fresh formula is presented, exactly how it is to be treated ; there is then not much difference in the time taken between making a batch of pills and tablets.

The former (pills) score perhaps when ordered in quantities of

two dozen or less; but in larger numbers the latter (tablets) certainly are quicker. An average prescription, containing aloin, nux vomica, and belladonna, was timed from start to finish, and as no tablets of the same formula were in stock, they therefore had to be made as soon as possible after being handed in. The time taken was forty-five minutes from calculating out the formula to finishing them off, forty-eight tablets being sent. For rush orders like this, first of all light the burner under the hot table, then proceed with the weighing out and granulating; while the granules are drying (which only takes fifteen or twenty minutes), get the machine ready and put in the punches and dies. By observing this order of operation no time is lost in the process.

In order to prevent tablet-making becoming a burden rather than a pleasure to the retailer, it is very important that the quantities made at one time should be in proportion to the demand, so that, for all the regular stock (excluding rush orders demanding new formulæ), enough of a sort should be made to last, say, six months, and devote a week or so twice a year to tablet-making. No "freak" formulæ have been attempted, such as creosote, calcium chloride, and phenol tablets, etc., for these may be gladly relegated to the pill department; even so, the scope of the tablet machine covers perhaps a wider range of drugs than the pill roller, and in every case when a prescription for pills or tablets has been presented, satisfactory tablets have been turned out.

Throughout the preparation of these notes I have received the unstinted help of my colleague, S. F. Fortnam, who has devoted much time and labour to the processes and formulæ described, and to whom my thanks are due.

Discussion

The President said he was sorry that Mr. Edmund White was not present, as he might have had something to say in reply to the author's remark on theobroma emulsion. Perhaps Mr. Robinson would take up the defence.

Mr. R. A. Robinson, junr., said that he did not feel equal to taking up the cudgels on behalf of his old chief, although he had no doubt that an excellent case could be made out. He did not claim much share in the work that had been done on theobroma emulsion; his name had been included more as a matter of courtesy and generosity.

Mr. E. W. Pollard said he remembered Mr. White's remark at the Bristol meeting about "speckley tablets." In the 90's, when tablets were unusual, Mr. Hardwick wrote a paper on the subject, and his tablets were "speckley." He used either French chalk, or some powdered fatty acid. This present paper would be welcomed by those who made tablets in a small way. The apparatus for the purpose was somewhat expensive, but one's reputation was a great matter, for on that rested the confidence of the public.

Mr. T. Maltby Clague scarcely agreed with Mr. Pollard, as very good results could be obtained from the use of talc powder. A practical point in reference to the machines for the work was of considerable importance. For the dies very hard steel was used, which was right; but the whole machine seemed to be constructed of the same very hard metal, and in the event of an accident happening, very few drills could be got to produce any effect on the steel for the purpose of repair. He took care to have the dies and punches immersed in heavy paraffin oil, which was capable of easy removal when the machine was wanted for use. No rust should be permitted, for there was a liability that the tablets might be stained. He dried by passing through charges of powdered talc. He could make tablets in less time than Mr. Chamberlain mentioned.

Mr. J. Grier said his experience was limited to showing students how to make one dozen phenacetin tablets, and that using a "Eureka" machine and an ethereal solution of vaseline as adhesive agent one found no difficulty in producing good tablets in less time than the forty-five minutes mentioned by the reader of the paper. The time was taken up in the drying which followed granulating, for which a No. 20 sieve was used. For lubricating the steel parts, vaseline was used.

Mr. H. Finnemore said the author did not give many data, and it would be interesting to know how long it took tablets made by his process to disintegrate. Some, when they came into contact with moisture, disintegrated rapidly, and others did so more slowly. The question of Dover's powders was mentioned; but he did not know that one would feel justified in making tablets without potassium sulphate and calling them tablets of Dover's powder.

Dr. C. Symes said he had never used theobroma emulsion, but he found a hygroscopic substance which was to be made into tablets kept well when cacao butter was used as an excipient.

THE COMPOSITION OF CERTAIN FORMATES*

By C. H. Hampshire, B.Sc., A.I.C., and
W. R. Pratt, B.Sc., A.I.C.

Since the introduction of formates into medicine the attention of pharmacists and manufacturers has been directed to the chemistry of these salts, with the result that many points of theoretical and practical value have been settled. The formulæ given in the British Pharmaceutical Codex, however, have been challenged on more than one occasion, and there still appeared need for investigation on this subject. An extended examination of commercial specimens of the principal formates, and investigation on the methods of preparation has led to the following results. Sodium formate as found in commerce sometimes consists of the anhydrous salt and sometimes of crystals of the dihydrate. The anhydrous salt should be used in pharmacy on account of its greater constancy and superior keeping properties. Ferric formate has the composition $Fe_3(OH)_2 \cdot (HCO_2)_7 \cdot 4H_2O$ assigned to it by Belloni, and not $Fe_2(HCO_2)_6 \cdot H_2O$, as stated in the Codex. The commercial salt has Belloni's formula. Magnesium formate has the formula $Mg(HCO_2)_2 \cdot 2H_2O$, and the commercial products agreed well with this composition. Calcium formate has the formula $Ca(HCO_2)_2$, as stated in the Codex. Some commercial samples were very impure. Quinine formate is not anhydrous, as stated in the Codex, but has the composition $C_{20}H_{24}N_2O_2 \cdot HCOOH \cdot H_2O$. The commercial specimens examined agreed well with this formula. Strychnine formate when freshly prepared has the composition $C_{21}H_{22}N_2O_2 \cdot HCOOH \cdot 2H_2O$, but it quickly effloresces. Some commercial samples had effloresced, and also contained an excessive amount of formic acid. The anhydrous salt, which is readily prepared and keeps well, should be used in pharmacy.

Analytical Methods

In the analysis of the various samples the following methods have been used. Formic acid in metallic formates may be determined with accuracy by the method of H. C. Jones.[1] The salt is heated with excess of standard potassium permanganate solution and sodium carbonate, a known excess of oxalic acid is then

* Communication from the Pharmaceutical Society's Research Laboratories.

added, and the solution is cleared by adding sulphuric acid. The excess of oxalic acid is then titrated with standard permanganate solution. The total volume of permanganate solution used less the permanganate equivalent of the oxalic acid gives the amount of the former required to oxidize the formic acid. The formic acid in alkaloidal salts was determined by titration in alcoholic solution with standard sodium hydroxide solution, using phenol-phthalein as indicator. Calcium and iron were determined by direct ignition, weighing as oxide, and magnesium by ignition followed by titration of the resulting oxide. The alkaloids were determined by precipitation from the aqueous solution with the smallest possible excess of alkali and extraction with chloroform or ether. In some cases the water of crystallization was found by direct drying. The solubilities have been determined by the method described by Lumsden.[2]

Sodium Formate

The composition of this salt as found in commerce varies considerably; some samples are practically anhydrous and others approximate more or less closely to the composition $HCOONa \cdot 2H_2O$. Several hydrates are described in the literature:—

Göbel [3] obtained a salt containing about 20 per cent. of water, which was apparently the monohydrate $HCOONa \cdot H_2O$. Souchay and Groll [4] prepared the anhydrous salt and also a hydrate, which, however, decomposed so quickly that they were unable to analyse it. Colson [5] states that he obtained the tetrahydrate, $HCOONa \cdot 4H_2O$, by Berthelot's synthesis at 0°C. Grosschuff [6] describes the trihydrate $HCOONa \cdot 3H_2O$, which was obtained by crystallization at 0°C. This changed on heating to 17°C. into the dihydrate $HCOONa \cdot 2H_2O$, which at 25° became converted into the anhydrous salt. Both hydrates readily effloresced in dry air, but were hygroscopic in a moist atmosphere. The melting-point of the anhydrous salt was found to be 253° instead of 200°, as given by Souchay and Groll [4]. Repeated attempts to prepare the mono- and tetrahydrates were made without success. The solubilities of the di- and trihydrates and of the anhydrous salt at different temperatures were also determined by Grosschuff. Lunan [7] and the Codex adopt the formula $HCOONa \cdot H_2O$, but Tyrer and Gosling [8] have shown that the composition of commercial sodium formate does not agree with this, and recommend that the formula $HCOONa \cdot 2H_2O$ should be substituted. The

experiments described below have been made with the object of ascertaining the best methods of producing the different forms of this salt and of comparing them as to their suitability for pharmaceutical use. Sodium formate was prepared by neutralizing pure formic acid with sodium carbonate and the product was crystallized under a variety of conditions. The principal results are as follows :—

Preparation of the Trihydrate

The trihydrate was obtained by treating a saturated aqueous solution at 10° with alcohol at the same temperature. The hydrate separated out as minute needles, which were filtered off at the pump and dried as quickly as possible by pressing on porous plate.

0·0436 Gm. required 7·7 c.c. N/10 $KMnO_4$; 60·04 per cent. HCOONa.

$HCOONa{\cdot}3H_2O$ contains 55·7 per cent. HCOONa.

The crystals rapidly deliquesced when placed in a bottle, but became almost completely anhydrous when exposed freely to air for three hours. This hydrate is of little practical use on account of its instability at ordinary temperatures.

Preparation of the Dihydrate

The dihydrate was obtained by crystallizing at temperatures between 25° and 18°. Attention to the temperature was necessary as the anhydrous salt crystallizes out above 25° and the trihydrate below 18°.

A solution saturated at 24° was allowed to evaporate slowly at about this temperature. The solution showed supersaturation, but, after seeding, deposited long stout prisms which were dried by means of the centrifuge.

0·028 Gm. required 5·3 c.c. N/10 $KMnO_4$; 64·4 per cent. HCOONa.

$HCOONa{\cdot}2H_2O$ contains 65·4 per cent. HCOONa.

The dihydrate was also obtained by treating a solution saturated at 20° with alcohol at the same temperature. The small needle-shaped crystals which separated were filtered off and dried in air on porous plate.

0·0459 Gm. required 8·7 c.c. N/10 $KMnO_4$; 64·4 per cent. HCOONa.

A third method by which the dihydrate was obtained was to

allow a solution, saturated at 70°, to cool, undisturbed and protected from dust, to 20°. On adding a crystal of the dihydrate the whole set to a semi-solid mass of small needles, and a slight rise in temperature took place. The crystals were dried by means of the centrifuge.

0·0523 Gm. required 9·75 c.c. N/10 $KMnO_4$; 63·4 per cent. HCOONa.

If crystallization was allowed to take place above 25° the crystals obtained were anhydrous. The dihydrate formed prismatic crystals which were very deliquescent in moist air and efflorescent in a dry atmosphere. These properties made the preparation of the substance for analysis very difficult. On heating to 130° in the air oven or to 40–50° *in vacuo* for some hours, the salt first partly melts and finally forms a granular mass, which is completely anhydrous. The instability of this hydrate under ordinary conditions renders it unsuitable for pharmaceutical purposes.

Preparation of Anhydrous Sodium Formate

This was obtained as a granular powder by evaporating a solution nearly to dryness on the steam bath and drying the product at 130°.

0·0572 Gm. required 16·7 c.c. N/10 $KMnO_4$; 99·3 per cent. HCOONa.

The anhydrous salt was obtained in small needles by allowing a solution, saturated at 123°, to cool with constant stirring to 30°, and drying the crystals at 115°. Long thick needles were obtained by allowing the solution to crystallize without stirring.

0·0427 Gm. required 12·5 c.c N/10 $KMnO_4$; 99·5 per cent. HCOONa.

Minute needle-shaped crystals of the anhydrous salt were also obtained by precipitation with alcohol at temperatures above 25°.

The specimens melted at 254°. The anhydrous substance is much less hygroscopic than the hydrates, and keeps well. Though many crystallizations were made under various conditions, it was not found possible to prepare the monohydrate. Samples prepared by the Codex method, the temperature being allowed to fall to about 15° during crystallization, proved to be mixtures of anhydrous salt and dihydrate.

Commercial Sodium Formate

Examination of commercial specimens showed that the salt as issued to the retail pharmacist is a very variable product. Of six samples analysed three were almost anhydrous, and three had roughly the composition of the dihydrate.

Description.	HCOONa Per cent.	Impurities.
A.—Small dry granular crystals	99·2	Chloride (traces).
B.—Dry crystalline powder .	98·44	Sulphate (traces); chloride (traces); iron (very small trace).
C.—Dry prismatic crystals .	97·7	Chloride (traces).
D.—Large granular crystals. Deliquescent . . .	70·1	Sulphate, chloride.
E.—Wet granular crystals of a brownish tint . .	61·2	Sulphate, chloride, iron (minute trace).
F.—Small damp crystals .	62·6	Sulphate (traces), chloride (traces).

The samples were free from oxalate, calcium, and heavy metals. The samples examined by Tyrer and Gosling [8] showed similar variations.

Ferric Formate

The Codex, in describing this salt, ascribes to it the formula $Fe_2(HCO_2)_6 \cdot H_2O$, and states that it can be prepared by digesting freshly precipitated ferric hydroxide in aqueous formic acid for several days, evaporating the filtered liquid to dryness at 70°, and drying the residue at 40°C. Since commercial samples of the drug prepared by this method do not give analytical figures in agreement with this formula, an investigation of the composition of substances prepared by this and other methods was carried out. A normal formate is described by Ludwig [9] as early as 1861, to which he ascribes the formula $Fe_2(HCO_2)_6$, and Scheurer-Kestner [10] also obtained a salt to which he ascribed the formula $Fe_2(HCO_2)_6 \cdot H_2O$, and which he states he prepared by dissolving freshly precipitated ferric hydroxide in formic acid; he also describes various basic formates obtained by boiling a solution of this salt.

Belloni [11] describes a salt prepared by dissolving ferric hydroxide in 50 per cent. formic acid ($d = 1·124$) on a water-bath, filtering,

evaporating down, and cooling. Copper-red needles were deposited, to which he ascribed the formula $Fe_3(OH)_2(HCO_2)_7 \cdot 4H_2O$. This salt was very soluble, and appeared to have the same characters as those prepared by Ludwig and Scheurer-Kestner. Belloni also describes various more basic salts prepared by the action of heat on a solution of this salt, all of which are, however, much less soluble. He also states that the soluble salt easily loses two molecules of water to give $Fe_3(OH)_2(HCO_2)_7 \cdot 2H_2O$ either *in vacuo* or on heating at low temperatures, but that if further heated more basic salts and, finally, $Fe_2(OH)_6$ and Fe_2O_3 are formed by loss of formic acid. Tyrer and Gosling [8] state that "the salt prepared after the manner of the Codex was found to contain 99·5 per cent. of the anhydrous salt," *i.e.*, $Fe_2(HCO_2)_6$, "and is without water of crystallization."

For the purposes of this investigation commercial samples of the salts, several of which were labelled as having been prepared in accordance with the Codex, have been examined, and several salts have been prepared from pure materials by various methods. In no case has it been found that the substance has the composition required by the formulæ $Fe_2(HCO_2)_6$ or $Fe_2(HCO_2)_6H_2O$, or any mixture of these two. On the other hand, they all gave analytical figures in accordance with Belloni's formula—

$$Fe_3(OH)_2(HCO_2)_7 \cdot 4H_2O.$$

Preparation of Ferric Formate

(*a*) *By Crystallization.*—Ferric hydroxide prepared from pure ferrous sulphate by oxidation with nitric acid and precipitation with ammonia was washed free of ammonium salts and in a very moist condition immediately shaken up with an excess of 25 per cent. aqueous formic acid. In about fifteen minutes the ferric hydroxide had disappeared, and was replaced by masses of fine copper-red needles. These were filtered off at the pump and air dried.

0·224 Gm. gave 0·092 Gm. Fe_2O_3 = 28·7 per cent. Fe.
0·0295 Gm. required 7·1 c.c. N/10 $KMnO_4$ = 54·1 per cent. HCO_2.
$Fe_2(OH)_2(HCO_2)_7 \cdot 4H_2O$ requires Fe = 28·5 per cent.
HCO_2 = 53·5 per cent.

(*b*) *By Precipitation with Alcohol.*—A super-saturated solution of the salt prepared as above at 60° was diluted with about 30 per cent. of alcohol. On cooling a mass of fine salmon-coloured needles was deposited. These were filtered off and air dried.

0·2696 Gm. gave 0·1101 Gm. Fe_2O_3. Fe = 28·6 per cent.
0·0379 Gm. required 9·05 c.c. N/10 $KMnO_4$ HCO_2 = 53·7 per cent.

(*c*) *By the Codex Method.*—Freshly precipitated ferric hydroxide was digested with an excess of aqueous 25 per cent. formic acid, at a temperature of about 50–60°, until all ferric hydroxide had dissolved. The liquid was filtered and evaporated on a water-bath at 70° to dryness and the residue dried at 40° in an air oven. A light copper-red gritty powder was obtained after drying for three hours.

0·38 Gm. gave 0·1556 Gm. Fe_2O_3 = 28·7 per cent. Fe
0·0598 required 14·2 c.c. N/10 $KMnO_4$ = 53·4 per cent. HCO_2.

On further drying it continued to lose weight, and at the end of thirty hours it contained 29·17 per cent. of Fe and 56·38 per cent. of (HCO_2). Using more concentrated formic acid up to 50 per cent. in all cases produced the same result.

(*d*) *From Ferric Sulphate and Calcium Formate.*—Hot solutions containing the calculated quantities of ferric sulphate and calcium formate dissolved in as little water as possible were mixed, the precipitated calcium sulphate filtered off, and the ferric formate caused to crystallize out by addition of alcohol. Masses of the typical reddish-brown needles were deposited.

0·4342 Gm. gave 0·1762 Gm. Fe_2O_3. Fe = 28·4 per cent.
0·0510 Gm. required 12·1 c.c. N/10 $KMnO_4$ (HCO_2) = 53·4 per cent.

In all these cases the salt obtained corresponds to the formula $Fe_3(OH)_2(HCO_2)_7 \cdot 4H_2O$, and not to the normal type.

The Codex method for the preparation of ferric formate requires alteration, as even at 40°C. the salt is liable to lose formic acid and give a more basic and less soluble product. The salt obtained, however, by crystallization from a super-saturated solution containing excess of formic acid is a beautifully copper-red crystalline salt, giving a clean solution and easily soluble. Crystallization can also be accelerated by addition of alcohol up to about 30 per cent., when very fine lighter coloured masses of needles are deposited, which are instantly soluble in water.

Attempts to Prepare Normal Ferric Formate

No salt having the right proportions of iron and formyl radicle could be obtained, although a less basic body corresponding to $Fe_3(OH)(HCO_2)_8 \cdot 2H_2O$ was prepared.

A quantity of pure $Fe_3(OH)_2(HCO_2)_7 \cdot 4H_2O$ was dissolved in 95 per cent. formic acid in the cold until saturation was complete, an almost black solution being formed. On standing a deep copper-red substance was deposited, and after thirty minutes the whole set to a solid mass. The substance was filtered off at the pump, washed with water until free from smell of formic acid, and air dried on porous plate.

0·3516 Gm. gave 0·1451 Gm. Fe_2O_3. Fe = 28·8 per cent.

0·0586 Gm. required 16·0 c.c. N/10 $KMnO_4$. HCO_2 = 61·4 per cent.

$Fe_3OH \cdot (HCO_2)_8 \cdot 2H_2O$ requires Fe = 28·9 per cent. HCO_2 = 61·9 per cent.

This salt is amorphous and almost insoluble in water or alcohol. Pure recrystallized $Fe_3(OH)_2(HCO_2)_7 \cdot 4H_2O$ was heated up with 95 per cent. formic acid under a reflux condenser on a water-bath for three hours. On cooling the precipitated solid was filtered off, washed with water, and dried.

0·3906 Gm. gave 0·1618 Gm. Fe_2O_3. Fe = 28·99 per cent.

0·0483 Gm. required 13·1 c.c. N/10 $KMnO_4 \cdot HCO_2$ = 61·02 per cent.

Moist freshly precipitated ferric hydroxide was dissolved in excess of 95 per cent, formic acid at 80° to saturation. On cooling crystals of a copper-red colour were deposited.

0·0627 Gm. required 14·7 c.c. N/10 $KMnO_4$. HCO_2 = 52·8 per cent.

0·2034 Gm. gave 0·082 Gm. Fe_2O_3. Fe = 28·2 per cent.

From this it appears that the normal salt cannot be obtained even when a large excess of 95 per cent. formic acid is used.

Dehydration of Ferric Formate

$Fe_3(OH)_2(HCO_2)_7 \cdot 4H_2O$ was dried in a vacuum desiccator over sulphuric acid for five days.

0·256 Gm. gave 0·1117 Gm. Fe_2O_3. Fe = 30·54 per cent.

0·0605 Gm. required 15·35 c.c. N/10 $KMnO_4$. HCO_2 = 57·1 per cent.

$Fe_3(OH)_2(HCO_2)_7 2H_2O$ requires Fe=30·38 per cent. (HCO_2) =56·96 per cent.

It was not possible to dehydrate further without losing some formic acid.

Solubility in Water and Alcohol

The solubilities of the salt in water and in absolute alcohol have

been taken over a range of temperatures. Saturated solutions of the salt in water are not stable. In contact with air they rapidly hydrolyse, the whole of the iron separating as a jelly-like mass of ferric hydroxide, and leaving a colourless solution. The same remark applies to the saturated solution in absolute alcohol, whilst in aqueous alcohol partial hydrolysis occurs and basic formates are precipitated.

The determinations were made by stirring up excess of the recrystallized salt with the required solvent in the apparatus described by Lumsden.[2]

In Water.

At 17°C. 1 Gm. soluble in 18·8 Gm. of water.
At 20°C. 1 Gm. soluble in 18·08 Gm. of water.
At 22°C. 1 Gm. soluble in 17·8 Gm. of water.
At 24°C. 1 Gm. soluble in 17·5 Gm. of water.
At 25·5°C. 1 Gm. soluble in 16·2 Gm. of water.
At 27°C. 1 Gm. soluble in 15·4 Gm. of water.
At 29°C. 1 Gm. soluble in 14·8 Gm. of water.
At 33·5°C 1 Gm. soluble in 13·9 Gm. of water.

In Absolute Alcohol.

At 19°C. 1 Gm. soluble in 21·8 Gm. of absolute alcohol.
At 22°C. 1 Gm. soluble in 16·0 Gm. of absolute alcohol.
At 23°C. 1 Gm. soluble in 13·1 Gm. of absolute alcohol.

When the crystals were dissolved in aqueous alcohol decomposition took place, and the filtered liquid contained excess of formic acid.

Commercial Ferric Formate.—The commercial specimens examined all gave figures corresponding to the formula $Fe_3(OH)_2 \cdot (HCO_2)_7 \cdot 4H_2O$. B was a crystallised specimen and the remainder had been prepared by the Codex method.

Description.	Fe (per cent.).	HCO_2 (per cent.).
A. Amorphous gritty powder. Soluble	28·7	53·54
B. Copper-red crystals, having an odour of formic acid	28·38	53·8
C. Gritty powder. Soluble	28·69	53·5
D. Gritty powder. Soluble	28·65	52·8
E. Fine light-coloured crystalline powder	29·1	54·78
F. Light-coloured gritty powder. Soluble	28·6	53·3

D. and E. contained traces of sulphates. B. C. D. and E. contained traces of chlorides.

Magnesium Formate

Souchay and Groll[4] and Voss[12] give to this salt the formula $Mg(HCO_2)_2 \cdot 2H_2O$. A specimen prepared by dissolving magnesium carbonate in the calculated quantity of 25 per cent. formic acid with the aid of heat, filtering and crystallizing, had this composition—

0·035 Gm. required 9·4 c.c. N/10 $KMnO_4$; 60·43 per cent. HCO_2. $Mg(HCO_2)_2 \cdot 2H_2O$ contains 60 per cent. of HCO_2 and 16 per cent. of Mg.

Five commercial samples were examined, and all were found to have the composition required by the above formula.

	Magnesium.	HCO_2.
A..	15·89 per cent.	60·08 per cent.
B..	16·07 ,,	59·67 ,,
C..	16·08 ,,	60·11 ,,
D..	15·9 ,,	59·83 ,,
E..	16·07 ,,	59·55 ,,

Calcium Formate

Plathan[13] states that this salt can be prepared in the anhydrous state by neutralizing aqueous formic acid with calcium carbonate. This is confirmed by Lumsden,[2] who found it impossible to prepare a hydrated form. The Codex adopts Plathan's method and formula, stating that the salt occurs as "anhydrous rhombic crystals." The solubilities have been determined over a wide range of temperatures by Lumsden[2] and by Krasnicki.[14] In the present investigation pure products have been prepared by the Codex method, and these on analysis have proved to be the pure anhydrous salt.

0·028 Gm. required 8·65 c.c. N/10 $KMnO_4$; 69·5 per cent. HCO_2. $Ca(HCO_2)_2$ contains 69·2 per cent.

Commercial Calcium Formate

Commercial samples have also been examined, and some of these proved to be very impure, one containing as much as 1·1 per cent. of calcium oxide and another 1·4 per cent. of calcium chloride.

Description.	Ca (per cent.).	(HCO_2) per cent.
A. Small opaque crystals. Alkaline to litmus	31·95 (0·74 per cent. Ca as CaO).	66·59
B. Moist grey mass	29·3 (1·4 per cent of $CaCl_2$)	64·6
C. White crystalline powder . .	31·06	66·7
D. Large transparent crystals . .	31·3	68·4
E. Large transparent crystals . .	31·4	68·7

A. and C. contained traces of sulphate. B. and C. contained chlorides.

Quinine Formate.—Quinine formate was first prepared by Bonaparte,[15] who described it as crystallizing readily in needles which are moderately soluble in water. Lacroix[16] showed that two salts of the alkaloid can be prepared, a normal formate of the composition $C_{20}H_{24}N_2O_2 \cdot 2HCOOH$ and a basic formate having the formula $C_{20}H_{24}N_2O_2 \cdot HCOOH$. The normal salt is unsuitable for pharmaceutical use on account of the readiness with which it loses formic acid, and the basic formate is always employed. This salt, according to Lacroix, is anhydrous and contains 87·56 per cent. of quinine and 12·45 per cent. of formic acid. The Codex adopts the formulæ of Lacroix and gives directions for preparing the basic formate by suspending quinine in water, adding the calculated quantity of formic acid and crystallizing. During this investigation several pure specimens have been prepared and analysed. The analytical figures as well as the behaviour on heating and *in vacuo*, show that basic formate of quinine is a monohydrate $C_{20}H_{24}N_2O_2 \cdot HCOOH \cdot H_2O$.

16 Gm. of quinine was suspended in 100 c.c. of distilled water at 50°, 2·5 Gm. of 95 per cent. formic acid added, and the mixture stirred until solution was complete. The liquid was filtered, allowed to cool, and the crystals filtered off. These were dried by suction and on porous plate in air. Melting-point 126°.

0·4983 Gm. required 12·8 c.c. N/10 NaOH = 11·8 per cent. HCOOH.

0·2672 Gm. gave 0·222 Gm. alkaloid = 83·08 per cent. quinine.

$C_{20}H_{24}N_2O_2HCOOH \cdot H_2O$ requires quinine = 83·5 per cent. HCOOH = 11·86 per cent. H_2O = 4·64 per cent.

0·6645 Gm. of the above preparation when heated in the air-oven kept at 125°C. for twelve hours gave 0·5837 Gm. residue; loss = 12·16 per cent.

The residue dissolved in alcohol required 5·83 c.c. N/10 NaOH. HCOOH = 4·03 per cent. quinine by difference = 83·81 per cent.

Under these conditions the salt thus loses 4·39 per cent. of water and 7·77 per cent. of formic acid.

0·7255 Gm. of the above preparation heated in a water oven at 100° for four hours gave 0·6897 Gm. of residue; loss = 4·9 per cent.

The residue required 17·3 c.c. N/10 NaOH = 10·97 per cent. of HCOOH.

At 100° the whole of the water is therefore lost, but very little formic acid. The anhydrous residue melted at 149–150°.

3·6438 Gm. of above preparation kept *in vacuo* for 100 hours gave 3·5438 Gm. residue; loss = 2·8 per cent.

0·308 Gm. of residue required 8 c.c. N/10 NaOH = 11·95 per cent. HCOOH.

The substance was still slowly losing weight, and on being left in the atmosphere gradually increased almost to its original weight. The salt is stable under ordinary conditions and is very soluble in water. The solubilities are given by Lacroix.

Commercial Quinine Formate

Five commercial samples have also been examined, and in all cases the content of alkaloid and formic acid was too low to correspond with the published formula. The results agree more closely with the formula for the monohydrate.

Quinine (per cent.).	HCOOH (per cent.).	M.P.
A. 83·5	11·82	125°–127°
B. 83·57	11·74	123°–124°
C. 84·25	11·88	125°
D. 84·18	12·02	126°–127°
E. 83·3	11·9	123°–124°

The samples were all neutral to litmus and gave colourless solutions.

Strychnine Formate

The Codex gives to this salt the formula $C_{21}H_{22}N_2O_2$ HCOOH $2H_2O$, and states that it can be prepared by allowing a solution of strychnine in aqueous formic acid to evaporate spontaneously.

It describes the salt as containing 80·29 per cent. alkaloid, 11·05 per cent. formic acid, and 8·65 per cent. water, and occurring

as a white crystalline powder of small acicular crystals, which are somewhat efflorescent at ordinary temperatures, and lose water and HCOOH at 100°, and which cannot be rendered anhydrous by driving off the water by means of heat. The solubility is given as 1·5 in water.

In the "Extra Pharmacopœia" it is stated that there is a tendency for this salt to effloresce down to $1\frac{1}{2}$ H_2O; the solubility is given as 1-2 in water, 1-6 in alcohol; it is stated that the salt can be prepared anhydrous.

Lunan[7] states that the salt can be rendered anhydrous below 90°C.

For the purposes of the present investigation five commercial samples have been examined, and several pure preparations have been made, of which the solubilities have been taken.

Preparation of Strychnine Formate

Sixteen Gm. of pure alkaloid was dissolved in 2 Gm. of 95 per cent. formic acid diluted with about 30 c.c. of water, using heat, in a loosely closed flask and filtered warm. On cooling a mass of fine white needles was deposited. These were filtered off at the pump and dried by suction and on porous plate in air.

0·4926 Gm. required 11·82 c.c. N/10 NaOH. HCOOH = 11·03 per cent.

0·48 Gm. gave 0·3894 Gm. alkaloid. Strychnine = 81·12 per cent.

$C_{21}H_{22}N_2O_2HCOOH{\cdot}2H_2O$ requires 80·29 per cent. of alkaloid, 11·06 per cent. of HCOOH, and 8·65 per cent. of water.

The salt formed long thick transparent needles when recrystallized from water. The aqueous solution was colourless and neutral to litmus.

It was found practically impossible to prepare and preserve a product containing two molecules of water. It was also found that the anhydrous salt could easily be prepared by keeping the product *in vacuo* for three days or by drying below 90° (*i.e.*, about 85°C.) as Lunan suggests.

The above preparation was kept in *vacuo* for three days, and then titrated with N/10 NaOH.

0·4961 Gm. required 12·9 c.c. N/10 NaOH = 11·96 per cent. HCOOH.

The anhydrous salt requires 12·10 per cent. HCOOH.

The above preparation was dried in the air oven at 90° for three hours and then titrated with N/10 NaOH.

0·4688 Gm. required 11·08 c.c. N/10 NaOH = 10·87 per cent. HCOOH.

The product was not completely soluble, and hence had lost formic acid as well as water. At temperatures below 85°C., however, no formic acid was lost.

Solubilities.

Using Lumsden's apparatus.

In Water.

at 19·5° 1 part soluble in 3·27 parts of water by weight.
at 24° 1 part soluble in 2·52 parts of water by weight.
at 27° 1 part soluble in 2·26 parts of water by weight.

In Absolute Alcohol.

at 18·5° 1 part soluble in 10·0 parts of alcohol by weight.
at 20° 1 part soluble in 9·7 parts of alcohol by weight.
at 22° 1 part soluble in 9·4 parts of alcohol by weight.

Commercial Strychnine Formate

Only two of the five commercial samples approximated at all closely to the Codex requirements, the others contained an excess of formic acid, and moreover gave a dirty brownish solution.

Alkaloid (per cent.).	HCOOH (per cent.).
A. 83·08	14·4
B. 83·02	14·4
C. 82·37	14·2
D. 79·6	10·91
E. 79·53	10·93

Preparations D and E were granular, the remainder were composed of very minute needles. The whole were readily soluble in water. A B and C were strongly acid to litmus, D and E were only slightly acid.

These results lead to the conclusion that it would be preferable to adopt the anhydrous salt for use in pharmacy.

In conclusion our thanks are due to Professor Arthur W. Crossley, F.R.S., and Mr. Edmund White for valuable suggestions during the progress of the work.

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Discussion

Mr. T. Tyrer paid tribute to the thorough verification of the results of previous workers. The ample bibliography was an excellent feature and might save readers much trouble. One conclusion forced itself upon his mind, namely, that in a multitude of formulæ one might have confusion. It was not easy for those who had not done work of this kind to say which salt would pay best to use, and by the word "pay" he did not mean the mere mercenary sense, but the satisfaction of one's clients. There were many substances which were attractive to one's eyes, but when they had left the manufacturer and been stored first with the wholesaler and then with the retailer, there came a time when they were wanted, and then they might not prove to be what they were represented to be. That was true of many compounds which seemed admirable. In this paper were encouraging statistics and facts about samples showing stability, except in the case of the ferric compounds, but even there one got accuracy and stability by a simple process. The commercial samples of ferric formate examined all gave figures corresponding to the formulæ of crystalline specimens, and some had been prepared by the Codex method, and there was the copper-red crystals having the odour of formic acid, and yet having the same formula as the others. With regard to the calcium formate, the charge about the uncertainty of commercial calcium formate was true, and it arose from a reprehensible practice. Calcium formate was on the market largely as a commercial product, and one might, for the purpose of the explanation, liken it to calcium chloride of commerce. He was not sorry to see that some commercial calcium formate had been censured by the authors in this monograph. He agreed that the mono-hydrate was a salt which must be largely used.

The President said the paper would be specially welcomed,

because it came from the Pharmaceutical Society's Research Laboratories.

NOTE ON SODIUM THIOSULPHATE SOLUTIONS [1]

By C. H. Hampshire, B.Sc., A.I.C., and
W. R. Pratt, B.Sc., A.I.C.

Some time ago in the course of certain investigations it was found necessary to make titrations with sodium thiosulphate solutions at regular intervals, and in accordance with custom the solutions were standardized each time before use. It was noticed, however, that standard solutions of decinormal strength remained unaltered for many weeks even when exposed to daylight in bottles of white glass.

Solution of sodium thiosulphate is generally considered to be unstable and to require frequent standardization, as the following quotations from well-known text-books will show :—

Menschutkin, *Analytical Chemistry* (1895) : "The solutions change on standing, especially under exposure to light, and must therefore be compared and restandardized from time to time."

Muter, *Analytical Chemistry* (1903) : "Decinormal 'hypo' deteriorates rapidly even under the most favourable circumstances, and must therefore be checked against N/10 iodine each day it is used." "It must be kept in dark amber-coloured bottles and carefully protected from dust."

Clowes and Coleman, *Quantitative Analysis* (1909). "The solution undergoes chemical change by the action of light, hence it should be kept in a dark blue Winchester quart bottle, in a cool, closed cupboard, the interior of which is painted dead-black. Even when these precautions against exposure to light are taken, the solution will require frequent titration ; but its permanency is much extended if 2 Gm. of potassium bicarbonate are added to each litre."

Fresenius, *Quantitative Chemical Analysis* (1876) : "Although the solution does not change rapidly, or to any great extent, it is still liable to gradual alteration, especially under the influence of light."

Other writers mention the deposition of sulphur, but do not discuss the reactions by which it is formed.

[1] Communication from the Pharmaceutical Society's Research Laboratories.

Sutton, *Volumetric Analysis* (1911): "It is advisable to preserve the solution in the dark. After a time all solutions of thiosulphate undergo a slight amount of oxidation and sulphur deposits upon the bottle; it is therefore advisable to titrate it previous to use.

Dittmar, *Quantitative Chemical Analysis* (1887): "Thiosulphate solution, . . . if made from *pure* salt, changes only very slowly. After long standing it deposits sulphur. As soon as this change shows itself the solution must be thrown away and renewed."

Thorpe, *Quantitative Chemical Analysis* (1896): "The solution should be kept in the dark; when exposed to light it slowly decomposes, with the precipitation of sulphur. Accordingly a fresh solution of the salt should be prepared from time to time."

In other books ammonium carbonate and sodium hydroxide are stated to decrease the liability of the solution to decomposition.

In Treadwell's *Analytical Chemistry* it is stated that some decomposition is caused in recently prepared solutions by the carbon dioxide dissolved in the water, thus:—

$$Na_2S_2O_3 + 2H_2CO_3 = 2NaHCO_3 + H_2S_2O_3$$
$$H_2S_2O_3 = H_2SO_3 + S.$$

Since sulphurous acid requires twice as much iodine for oxidation as the sodium thiosulphate from which it is produced, the solution apparently becomes stronger, but after all the carbon dioxide has been used up, the solution can be kept for months without suffering any appreciable change in concentration. It is stated also that ammonium carbonate aids rather than retards decomposition.

As these statements are somewhat conflicting, it was thought advisable to make as complete an investigation as possible of this matter, and the present paper is a brief record of some of the experiments made. The points to which attention was directed were the influence of (*a*) light, (*b*) time, (*c*) material of the bottles, (*d*) alkalies, upon the keeping properties of the solutions, and the following solutions were accordingly prepared and kept as described.

Series I

Made with the pure recrystallized salt.

A. N/10. Kept in white glass bottle exposed to daylight.

B. N/10. Kept in amber glass bottle exposed to daylight.

C. N/10. Kept in blue glass bottle exposed to daylight.

D. N/10 + 5 per cent. NaOH. Kept in white glass bottle exposed to daylight.

E. N/10 + 5. per cent $(NH_4)_2CO_3$. Kept in white glass bottle exposed to daylight.

F. N/10. Kept in white glass bottle in the dark.

G. N/10. Kept in blue glass bottle in the dark.

H. N/10. Kept in amber glass bottle in the dark.

K. N/2. Kept in white glass bottle exposed to daylight.

L. N/2. Kept in white glass bottle in the dark.

The solutions were checked at frequent intervals by means of decinormal iodine solutions freshly prepared from recently sublimed iodine, also by means of freshly prepared potassium dichromate solution.

The titre of all the solutions was unchanged after a period of eight months. The initial change indicated by Treadwell was not observed. In order to ascertain if the presence of impurities in the salt used had any effect on the keeping properties of the solutions, some of the experiments were repeated, using other samples of sodium thiosulphate.

Series II

Prepared from the ordinary crystallized salt.

M. N/10. Kept in white glass bottle exposed to daylight.

N. N/10. Kept in white glass bottle in the dark.

No change took place in the titre of these solutions after keeping for nearly four months.

Series III

Prepared from ordinary photographic "hypo."

O. N/10. Kept in white glass bottle exposed to daylight.

P. N/10. Kept in white glass bottle in the dark.

No change in the titre of these solutions was observed at the end of four weeks.

In solutions A, C, E, F, G, H, K, and L a small amount of a white curdy deposit slowly formed. This was found by examination under the microscope and by chemical tests to consist of minute crystals of sulphur. The solutions then contained small quantities of sulphate, but it was not found possible to detect the presence of sulphite. It appears that semi- and decinormal sodium thiosulphate solutions may undergo some decomposition

on keeping, but it is so slight that it does not render necessary the elaborate precautions prescribed by some writers for the preservation of the solution. The solution after keeping for eight months is quite reliable for volumetric analysis without restandardization. It is not possible to say at present what causes the deposition of sulphur ; it may be due to oxidation or to the action of carbon dioxide or to a simple decomposition brought about by the action of light. It is to be noted that in our solutions the presence or absence of light or the colour of the bottles had apparently no effect in determining the deposition of sulphur. The nature of the primary product of the change remains also to be settled. According to some authors it is sodium sulphite, but Marmier (*Compt. rend.*, 1912, **154,** 32) has found that solutions containing less than 6 Gm. per litre are decomposed by the light from a 240-watt lamp, placed 6 to 8 cms. from the solutions, at first into sodium hyposulphite and sulphur. After seventy minutes' exposure only sodium sulphite is present in the solution. Experiments on the keeping properties of more dilute solutions of sodium thiosulphate under ordinary conditions are in progress, and the nature and cause of the decomposition will be dealt with in a later communication.

Discussion

Mr. J. Grier said he had had trouble with decinormal solutions of thiosulphate. It depended on the crystals, for one lot would yield a good result and another would not. Thinking the heavy deposit was due to acidity, he added borax which prevented precipitation, but gave a brown colour, which appeared to be due to traces of lead present in the thiosulphate crystals.

Mr. C. H. Hampshire in reply said that the deposition of sulphur did not alter the strength of the solution as tested by iodine. Three different samples were tried, one from a firm of the highest reputation, an ordinary sample and one sold for photographic purposes. The same results were obtained. The last was examined for only four weeks, but there was no change. They did not observe the dark colour referred to, but it would probably be due to the presence of lead.

THE PROPORTION AND COMPOSITION OF THE ALCOHOLS IN GERANIUM OILS

By W. H. Simmons, B.Sc.

Although the alcoholic constituents of Geranium or Pelargonium oils have now been shown by Schimmel to be rather numerous, linalol, phenyl ethyl alcohol, α-terpineol, menthol, and amyl alcohol having been found, in addition to geraniol and citronellol, the two latter, in the free and combined state, form the main constituents of the oils, and hitherto but little attempt has even been made to differentiate between these, any reference in an analysis of geranium oil to the alcoholic constituents being almost invariably confined to the percentage of total alcohols, as determined by acetylation, and calculated as geraniol. The only exception to this, to my knowledge, is the work of MM. Jeancard and Satie on the separation of the citronellol from the other alcohols by treatment with 98-100 per cent. formic acid, a process, I believe, first proposed for the analysis of otto of rose by Schimmel (Half-yearly Report, October, 1904, p. 81), which is stated to convert citronellol into citronellyl formate, and the other alcohols into terpenes. Their investigations do not appear to have received much publicity in this country, and the following notes deal with some attempts to discover whether the process actually determines the true percentage of citronellol, or whether it is of empirical value in comparing different geranium oils. Theoretically, of course, it seems scarcely probable that the citronellol could be completely esterified by merely boiling with formic acid, as an equilibrium point would almost certainly be reached, beyond which esterification would not proceed.

Before coming to these experiments, however, it may be useful to briefly refer to the matter of Total Alcohols, calculated as Geraniol. The following limits have been suggested for African and Bourbon (or Reunion) oils :—

African.	Bourbon.	Authority.	Reference.
66 to 77	68 to 78	Schimmel	Semi-annual Report, Oct., 1911, p. 52.
	75 to 85	E. J. Parry	"Chemistry of Essential Oils."
68 to 76	68 to 74	Jeancard and Satie	A small brochure on essential oils published in French.

So far as my own experience goes, extending over several years, I find that while Schimmel's limits cover most genuine oils of both varieties, the total alcohols in a Bourbon oil rarely fall below 70 per cent., but frequently lie between 70 and 75 per cent., though occasionally approaching 80 per cent.

The formylation process, as recommended by MM. Jeancard and Satie, consists in heating 10 c.c. of oil with 20 c.c. of 98-100 per cent. formic acid, in a flask attached to a reflux condenser for one hour on either a water-bath or a sand-bath. In one of their publications a water-bath is referred to, but in a private communication to myself they state that a sand-bath should be used. A few comparative determinations have therefore been made, using both methods of heating, but this appears to have little effect on the result, and as when the mixture of oil and formic acid is boiled on a sand-bath considerable bumping occurs, heating on a water-bath is much to be preferred. It may be mentioned here that the addition of 2 Gm. anhydrous sodium formate per 10 c.c. oil, while it enables the mixture to be boiled steadily on a sand-bath, does not affect the result.

To prove whether the results obtained represent the true citronellol content I have determined the "total alcohols" by acetylation, and the "citronellol" by formylation of (1) Schimmel's geraniol, (2) Schimmel's citronellol, and (3) a mixture of (1) and (2) in equal proportions, with the following results :—

—	Total Alcohols as Geraniol.	Citronellol.
1. Geraniol	99·6 per cent.	13·7 per cent.
2. Citronellol	[1]100·4 „	83·4 „
3. Mixture of 1 and 2 in equal proportions	—	47·3 „

[1] Or calculated as citronellol, 101·6 per cent.

Formylation of a sample of Palmarosa oil also gave an apparent citronellol content of 14 per cent. From these results it is evident that, assuming the above samples to represent 100 per cent. geraniol, and 100 per cent. citronellol, formylation does not do either of the things it is assumed to do, *i.e.*, it does not completely convert geraniol into terpene, and it does not completely esterify citronellol.

To ascertain the value of the process as a comparative test a number of African and Bourbon geranium oils have been examined by the two processes, with the following results :—

	Total Alcohols as Geraniol.	Citronellol.	Percentage Composition of Alcohols.	
	Per cent.	Per cent.	Geraniol.	Citronellol.
African	72·8	40·0	45	55
	70·0	42·8	39	61
	79·5	33·4	58	42
	69·3	32·0	54	46
	69·6	34·8	50	50
	76·8	33·6	56	44
Bourbon	73·0	50·2	31	69
	71·7	44·0	39	61
	70·4	46·8	34	66
	69·7	51·0	27	73

These results may be tabulated as follows :—

—	Citronellol, Per cent. on Oil.	Percentage Composition of Alcohols.	
		Geraniol.	Citronellol.
African . . .	32 to 43	39 to 58	42 to 61
Bourbon . . .	44 to 51	27 to 39	61 to 73

compared with the following figures given by MM. Jeancard and Satie :—

—	Citronellol.	Percentage Composition of Alcohols.	
		Geraniol.	Citronellol.
African . . .	37 to 43	40 to 50	50 to 60
Bourbon . . .	50 to 65	20 to 40	60 to 80

While, therefore, I confirm MM. Jeancard and Satie that Bourbon oil contains more citronellol than does African oil, I do not find quite so much citronellol in Bourbon oil as they do. From these results the process appears to be of considerable utility in judging of the quality of a geranium oil, though I propose shortly to investigate the subject further, using the phthalic anhydride method for separating citronellol from geraniol.

In conclusion, it may be of interest to give the corresponding figures obtained for three less common varieties of geranium oil :—

—	Total Alcohols as Geraniol.	Citronellol.	Percentage Composition of Alcohols.	
			Geraniol.	Citronellol.
	Per cent.	Per cent.		
Asian	68.4	63·9	6·6	93.4
Corsican	69·8	30·3	57	43
Trappe de Staoüeli . .	71·5	27·9	61	39

I desire to acknowledge with thanks the help of my assistant, Mr. H. J. Llewellyn Parker, who has carried out several of the determinations in this paper.

MERCURIC OXIDE AS A STANDARD FOR VOLUMETRIC ANALYSIS

By Professor L. Rosenthaler and A. Abelmann

Although the number of standard substances proposed for quantitative analysis is large, up to now there is no substance at our disposal that can be used for the four chief volumetric operations—acidi- and alkali-metry, iodimetry, oxidimetry, and argentometry.

We have found that we possess in mercuric oxide such a substance, since it has all those properties that we demand in a standard body. These are chiefly the following :—

(1) The substance must be easily obtainable in a pure condition.

(2) It must be stable.

(3) It must be capable of being weighed as quickly and accurately as possible without special precautions ; therefore, it must not be hygroscopic.

(4) Preferably it should not contain any water of crystallization, or if it does, this must not be easily given off.

(5) It should possess as many uses as possible.

All these conditions are satisfied by mercuric oxide. Its preparation is simple, and it can be obtained pure in commerce at a cheap rate. Further, if protected from the light, it is absolutely stable, as is proved by the fact that the sample used in the following experiments had not changed in eight months. It contains no water of crystallization, nor is it hygroscopic.

The mercuric oxide used in these experiments was obtained from Kahlbaum. Its purity was proved by estimating the

amount of mercury in it by the sulphide method, and the following results were obtained :—

I.—1·4677 HgO gave 1·5752 HgS = HgO, 99·95 per cent.
II.—1·0509 HgO gave 1·1277 HgS = HgO, 99·95 per cent.

The mercuric oxide can therefore be taken as pure, especially as no impurities could be found by qualitative tests.

Mercuric Oxide as a Standard in Alkalimetry and Acidimetry

The method depends upon the fact that mercuric oxide in the presence of sodium chloride dissolves in the equivalent quantity of hydrochloric acid to form the neutral compound $HgCl_2 \cdot 2NaCl$.

$$HgO + 2HCl + 2NaCl = HgCl_2 \cdot 2NaCl + H_2O.$$

Hence it follows—

2 litres N/1 Hydrochloric Acid = 216 Gm. HgO.
1 litre N/1 Hydrochloric Acid = 108 Gm. HgO.
1 litre N/10 Hydrochloric Acid = 10·8 Gm. HgO.
1 c.c. N/10 Hydrochloric Acid = 10·8 Mgm. HgO.

The following are necessary :—

(1) N/10 acid and alkali.
(2) Neutral sodium chloride solution.
(3) p-Nitrophenol or iodoeosin as an indicator.

The standardization with mercuric oxide is best conducted as follows :—

A weighed quantity of mercuric oxide is dissolved in excess of N/10 hydrochloric acid by warming on the steam-bath with the addition of sufficient neutral sodium chloride solution. After cooling, the excess of acid is titrated back with N/10 caustic soda. As indicator we have used nitrophenol as well as iodoeosin. For the standardization of the N/10 acid we use sodium oxalate as recommended by Sorensen.[1]

We give below the following data from numerous results we have obtained :—

HgO taken.	N/10 HCl calculated.	N/10 HCl used.
0·3652 Gm.	33·82 c.c.	33·82 c.c.
0·1042 Gm.	9·65 c.c.	9·65 c.c.
0·1561 Gm.	14·44 c.c.	14·42 c.c.
0·0891 Gm.	8·25 c.c.	8·25 c.c.
0·2960 Gm.	27·40 c.c.	27·44 c.c.

[1] *Zeitschr. f. analyt. Chemie*, **36**, 639 ; **42**, 333 ; **42**, 512 ; **44**, 156 ; **45**, 217.

Mercuric Oxide as a Standard in Iodimetry

Rupp's method for the determination of mercury[1] is the basis of the use of mercuric oxide as a standard in iodimetry. In this the mercury is precipitated from alkaline solution of the double iodides with formaldehyde. The solution is then acidified with acetic acid, an excess of iodine is added, and the iodine uncombined as mercuric iodide is then titrated with sodium thiosulphate.

$$HgO \rightsquigarrow Hg.$$
$$Hg + I_2 = HgI_2$$

From this it follows :—

2 litres N/1 iodine solution = 216 Gm. HgO.
1 litre N/1 iodine solution = 108 Gm. HgO.
1 litre N/1 iodine solution = 108 Gm. HgO.
1 c.c. N/10 iodine solution = 10·8 Mgm. HgO.

Required.—(1) Hydrochloric acid and potassium iodide solution.

(2) Caustic soda, about 10 per cent.

(3) Formaldehyde solution.

(4) Acetic acid.

(5) N/10 iodine and sodium thiosulphate solutions.

Process.—Mercuric oxide is dissolved in hydrochloric acid in a glass-stoppered flask and sufficient potassium iodide is then added so that the precipitate of mercuric iodide first formed redissolves. The solution is then made alkaline with 10–20 c.c. of 10 per cent. caustic potash, and while rotating the flask a mixture of about 3 c.c. of pure 35 per cent. formaldehyde solution and 10 c.c. of water is added. After shaking for about three minutes the mixture is acidified with dilute acetic acid, again shaken thoroughly, and excess of N/10 iodine solution added. After vigorous shaking and noting that no more mercury remains undissolved at the bottom of the flask the excess of iodine is titrated with or without the use of the starch solution.

Results

HgO taken.	N/10 Iodine calculated.	N/10 Iodine used.
0·1559 Gm.	14·43 c.c.	14·43 c.c.
0·2354 Gm.	21·80 c.c.	21·80 c.c.
0·1134 Gm.	10·50 c.c.	10·52 c.c.
0·2084 Gm,	19·30 c.c.	19·26 c.c.

[1] *Arch. d. Pharm.*, **243** (300), 1905; *Chem. Zeitg.*, 1908, S. 1077.

Mercuric Oxide as a Standard in Oxidimetry

The basis of this method is as follows :— Mercuric oxide is either reduced to mercury with formaldehyde as in the foregoing section, or by means of potassium arsenite in alkaline solution. The mercury is filtered off and after the necessary washing is converted into mercuric sulphate by means of potassium permanganate and sulphuric acid. The excess of potassium permanganate is titrated with oxalic acid.

$$5Hg + 2KMnO_4 + 8H_2SO_4 \overset{HgO}{\underset{}{\Longrightarrow}} 5HgSO_4 + K_2SO_4 + 2MnSO_4 + 8H_2O.$$

From this, since $2KMnO_4 = 5O$.

2 litres	N/1	$KMnO_4$	= 216 Gm. HgO.
1 litre	N/1	,,	= 108 Gm. HgO.
1 litre	N/10	,,	= 10·8 Gm. HgO.
1 c.c.	N/10	,,	= 10·8 Mgm. HgO.

For the following experiments the decinormal permanganate solution was standardized with neutral sodium oxalate as proposed by Sorensen, 0·0067 Gm. of this salt corresponds to 10c.c. N/10 permanganate solution. The following are necessary for the standardization of potassium permanganate with mercuric oxide.

(1) N/10 permanganate and oxalic acid solution.

(2) Potassium iodide.

(3) Dilute sulphuric acid (1+ 2).

(4) Solution of sodium or potassium hydroxide, about 10 per cent.

(5) Formaldehyde or potassium arsenite.

Method.—After many trials the standardization was carried out as follows : The process was conducted as just described as far as the precipitation with formaldehyde. After some minutes the whole was filtered through an Allihn tube, provided with glass wool below, and over it a very deep layer of asbestos, and washed with distilled water until the washings no longer gave a violet colour when tested with morphine-sulphuric acid. The contents of the Allihn tube are then transferred to the glass-stoppered flask in which the reduction was carried out ; this is done by replacing the tube in the flask in the reversed position, and by means of a glass rod pushing the asbestos pad with the mercury into the flask, and washing out with distilled water.

After making strongly acid with sulphuric acid, a considerable excess of potassium permanganate is added, and the whole vigorously shaken until no undissolved mercury remains at the bottom of the flask. As soon as all the mercury has dissolved an amount of oxalic acid almost equivalent to the permanganate is run in, the liquid warmed to about 50° and then titrated back with potassium permanganate.

Instead of formaldehyde we have lately used potassium arsenite as a reducing agent. This was added to the solution mentioned above, warmed for some time on the water-bath, then filtered, and the process conducted as described. The results were equally good. We prefer the arsenite method because the mercury is more easily washed and more quickly dissolved by the permanganate solution.

Results with formaldehyde—

HgO taken.	N/10 Permanganate calculated.	N/10 Permanganate used.
0·2186 Gm.	25·75 c.c.	25·80 c.c.
0·1504 Gm.	13·95 c.c.	13·93 c.c.
0·2092 Gm.	19·26 c.c.	19·37 c.c.

With potassium arsenite—

HgO taken.	N/10 Permanganate calculated.	N/10 Permanganate used.
0·1388 Gm.	12·88 c.c.	12·85 c.c.
0·2555 Gm.	23·65 c.c.	23·65 c.c.
0·1810 Gm.	16·72 c.c.	16·76 c.c.

Mercuric Oxide as a Standard in Precipitation Analysis

This method is founded on that introduced by Volhard and improved by Rupp and Krauss. Mercury in nitric acid solution is titrated with ammonium sulphocyanide in the presence of iron alum as indicator.

$$HgO + 2HNO_3 = Hg(NO_3)_2 + H_2O$$
$$Hg(NO_3)_2 + 2NH_4(CNS) = Hg(CNS)_2 + 2NH_4NO_3$$

From this it follows :—

2 litres	N/1	NH_4CNS = 216 Gm. HgO.
1 litre	N/1	NH_4CNS = 108 Gm. HgO.
1 litre	N/10	NH_4CNS = 10·8 Gm. HgO.
1 c.c.	N/10	NH_4CNS = 10·8 Mgm. HgO.

The ammonium sulphocyanide is standardized by means of silver nitrate solution, and the value of this determined gravimetrically.

Required.—(1) N/10 Ammonium sulphocyanide and silver nitrate solutions.

(2) A cold saturated solution of iron ammonium alum to which sufficient nitric acid has been added to remove the brown colour.

(3) Concentrated nitric acid.

The method is carried out as follows :—

An exact weight of mercuric oxide is dissolved in nitric acid. Concentrated nitric acid and about 3 c.c. of the iron solution are added and the liquid then titrated with ammonium sulphocyanide solution until a faint brownish red colour appears.

HgO taken.	N/10 NH_4CNS calculated.	N/10 NH_4CNS used.
0·2133 Gm.	19·75 c.c.	19·72 c.c.
0·1873 Gm.	17·34 c.c.	17·38 c.c.
0·2877 Gm.	26·64 c.c.	26·64 c.c.
0·1788 Gm.	16·56 c.c.	16·55 c.c.
0·0944 Gm.	8·74 c.c.	8·73 c.c.

Discussion

Mr. T. Tyrer called attention to the statement as to the degree of purity attained being 99·95 per cent. in a particular make. Such a standard was regularly attained commercially in this country, so there seemed to be no special merit in the particular form mentioned by the authors.

Mr. H. Finnemore said the expression 99·95 per cent. really meant that the substance was pure.

NOTES ON THE POLENSKE AND REICHERT VALUES OF SOME OILS[1]

By. G. D. Elsdon, B.Sc., A.I.C., and
Herbert Hawley, M.Sc., A.I.C.

With the exception of one or two edible oils practically no Polenske figures are available in literature, and we therefore

[1] Communication from the City of Birmingham Analytical Department.

thought that it might be both interesting and useful to determine this figure on various oils. Reichert figures too have not been published on many samples, and we have included this in with our results, especially as this figure is nearly completed in the course of the Polenske determination. The oils for which results are given, Table I, were quite normal in every respect, all having low acid values. The determinations have all been carried out according to Polenske's directions, using the standard apparatus described by him, and, in many cases, were done in duplicate.

The figures themselves are, on the whole, much as might have been expected, but the Polenske values for different samples of the same oil are much more constant than are the Reichert values, and for this reason we give the range of the Reichert values for different samples of the same oil. As the Polenske values for different samples of the same oil did not differ by more than 0·1 we have not given any range in this case.

TABLE I

Oil.	No. of Samples.	Reichert.	Polenske.
Apricot kernel	2	0·3	0·3
Colza	6	0·1–0·5	0·3
Castor	5	0·2–2·3	0·2
Linseed	10	0·0	0·1
Soy	4	0·1–0·4	0·3
Almond	2	0·2–0·5	0·2
Cotton seed	10	0·2–1·0	0·4
Sesame	4	0·1–0·4	0·4
Cod liver (Newfoundland)	4	0·1–0·2	0·6
Olive	17	0·2–0·8	—
Arachis	2	0·4–0·5	—
Croton	1	12·7	1·2
Various fish oils	20	0·1–0·8	0·2–0·7

The figure for linseed oil is interesting—we have never found a sample of linseed oil which has given an appreciable amount of soluble volatile acids; it is a most suitable oil to use when determining the blank of the chemicals used in the Reichert process.

We have also examined a few old oils, and we give the results in Table II, together with the acidities. The samples were some ten years old.

TABLE II

Oil.	Acidity % KOH.	Reichert.	Polenske.
Cotton seed . . .	4·04	11·1	0·6
Menhaden. . . .	5·04	11·0	0·9
Cod liver	1·02	4·6	0·6
Brusmer	2·63	8·2	0·6

The values of the Reichert figures for these oils are remarkable, especially as the Polenske value has only risen slightly. It is, of course, quite evident that soluble volatile acids have been formed, but at present we have no knowledge as to their nature; this may form the subject of a future communication.

We have to thank our colleague, Mr. J. A. L. Sutcliffe, A.I.C., for some of the above figures, and Messrs. Southall for the gift of many samples of oil.

PRACTICE SECTION

The meeting of the Practice Section was held on Tuesday afternoon, July 21, at 2.30 p.m. The proceedings consisted of a discussion upon "The Operation of the Sale of Food and Drugs Acts." Mr. W. S. GLYN-JONES, M P., occupied the chair, and there was a large attendance of delegates and members.

THE CHAIRMAN reminded those present that there were four papers dealing with the subject under discussion from four different points of view. He would suggest that the reader of each paper should have ten minutes and that there should be subsequently a free discussion, each speaker being limited to five minutes. At the conclusion of the discussion the readers of the four papers, in their order, would each have five minutes in which to reply.

THE OPERATION OF THE SALE OF FOOD AND DRUGS ACTS IN RESPECT OF DRUGS

BY H. WIPPELL GADD (*Barrister-at-Law*).

To maintain uncompromisingly the principle of purity in medicine is not only a cardinal article in the constitution of this Conference, but also a fundamental rule of practice with pharmacists, whether they are members of the Conference or not.

The object of the statutes known collectively as "The Sale of Food and Drugs Acts" is well expressed in the full title of the principal Act, that of 1875 (38 and 39 Vict. c. 63): "An Act to make better provision for the Sale of Food and Drugs in a pure state."

In spite, however, of this community of intention, pharmacists are justly dissatisfied with the said Acts, and the administration of them. This is not merely due to the inherent unpopularity of penal statutes, but to serious defects in the Acts, and to grave, and in not a few instances, scandalous mistakes of administration.

As regards the Sale of Drugs, it is upon pharmacists that the Acts have the fullest incidence.

The laws which deal with adulteration have no concern with medicines dispensed by medical men for their patients.

There is no direct contract between the prescriber and the patient as to the strength or purity of the medicine supplied.

These facts provide one of the most cogent arguments for the

separation of prescribing and dispensing, for it is only by such separation that patients can be assured of obtaining the medicines they require in the highest state of purity and efficiency.

When a physician prescribes specifically the exact remedy which in his opinion is required by his patient, pharmacists, apart altogether from the honourable traditions of their calling and their personal integrity, are compelled by the operation of the Sale of Food and Drugs Acts to fill the specification with all faithfulness.

If the physician dispenses as well as prescribes there is no such safeguard.

In saying this, I am not actuated by any want of respect for the medical profession, or for such members of it as deem it wise or desirable to perform dual functions, nor do I wish to cast a doubt upon any of the sources of supply from which doctors draw their drugs, but the fact that drugs sold or dispensed in a pharmacist's open shop are liable to trial purchase at any time by an inspector under the Sale of Food and Drugs Acts, whereas those in a doctor's surgery are not so liable, puts the two methods on different planes.

All who have followed the operation of the Acts know that many of the defects alleged are not such as are inherent in the drugs in their original condition, but are those which are caused by deterioration.

To take a familiar example, sweet spirit of nitre is a drug which is very frequently purchased for analysis, and whether or no the percentage of ethyl nitrite be an absolute criterion of the therapeutic efficiency of the spirit, there is no doubt that the constant examination of samples, in order to ascertain if they have maintained their strength as regards this ingredient, has impressed upon pharmacists the necessity of not only making or buying at full strength, but also of efficiently storing.

No such outside influence has been or can be brought to bear upon medical men who dispense for their patients, and it is *prima facie* improbable that many of them are able to ensure that the full strength of the spirit is maintained by periodical estimation by a nitrometer.

In some measure, also, the Acts are more stringently applied to pharmacists than to unqualified dealers in drugs.

The latter are, of course, subject to the operation of the Acts, and with regard at least to articles which are well recognized as drugs, they are as much under inspection as pharmacists.

But it is by no means always clear what is included by the word "drugs." The principal Act defines a drug as including medicine for internal and external use, but it is a question of fact to be decided by weighing evidence whether in any particular case the article in question is or is not a drug.

Pertinent evidence is sometimes found in the source from which a sample was obtained, thus: in the case of Fowle *v.* Fowle (1896, 75 L.T. 714) the question arose as to whether beeswax was a drug, and was largely decided upon the evidence that it had been sold by a grocer.

Mr. Justice Grantham, in the course of his judgment, said:—

"I do not think that beeswax is a drug, sold as it is by a grocer under the circumstances in this case. Beeswax may be in a drug in some cases, but it is very often used for non-medicinal purposes. It was not here sold by a chemist, where one would naturally go for drugs, but by a grocer in a small country shop."

The consideration of the legal definition of the word "drug" brings us face to face with the chief defect in the Acts, and the cause of much of their mal-administration. Strange as it may seem, Acts, which are designed to secure that drugs are supplied in a pure state, set up no legal standards of purity for drugs, and provide no procedure by which such standards may be elaborated.

The unfortunate public analyst has cast upon him the duty of reporting as to whether a particular sample is of the nature, substance and quality demanded by the purchaser, without any definite guidance as to the indices of these attributes. In his extremity he has not unnaturally resorted to the British Pharmacopœia, hailing this work as a ready-made and authoritative standard calculated to help him out of his difficulties.

But the British Pharmacopœia is not an authority under the Sale of Food and Drugs Acts, nor, indeed, is it fitted to be one so long as it is produced in the ineffective way which has up to the present obtained.

The Pharmacopœia is, however, valuable as evidence of what is a standard between prescribers and dispensers, and in the absence of any conclusive evidence of any other standard obtaining commercially, may be, and has been, in a series of cases, held to be binding.[1]

When the President of the Conference asked me to open this

[1] *Vide* White *v.* Bywater, L.R. (1887), 19 Q.B.D. 582; Dickins *v.* Randerson, L. R. (1901), 1 K.B.D. 437; Boots, Cash Chemists (Southern) Ltd. *v.* Cowling, (1903), 67 J.P. 195.

discussion, he was good enough to tell me that he intended to deal with the question of the production of the Pharmacopœia in his address, and I am in cordial agreement with him that no Pharmacopœia can be produced which will be satisfactory for all the purposes for which it may properly be used, unless it be edited by a joint committee of medical men and pharmacists, with some representatives of chemical science and analytical practice. Further, a book which is intended to serve as a standard in commercial matters must take cognizance of existing commercial conditions, and there should be ample opportunity given in some such way as has been suggested in the Presidential address for the various interests concerned to inspect, consider, and if necessary, object to proposed alterations in the Pharmacopœia before they become operative.

A Pharmacopœia thus produced and compiled for the purpose, *inter alia*, of serving as a standard under the Sale of Food and Drugs Acts, would be of great service as a presumptive standard, that is to say, if any drug were found by a public analyst not to conform with the standards and tests of the Pharmacopœia, the onus would rest on the vendor of the drug of proving that the standards or tests were incorrect or unreasonable, or not such as should be applied to that particular drug.

But pending the production of such a Pharmacopœia, some other course of procedure must be taken if past injustices are not to be repeated.

Before suggesting remedies, however, it may be well to deal with defects in the administration of the Acts.

In the first place the method of taking samples leaves much to be desired. It is difficult to discover who is primarily responsible for the taking of samples under different authorities.

Sometimes an inspector would appear to act on his own initiative; in other districts he is apparently inspired by the medical officer of health, or by the public analyst, and in still others he may receive hints from a committee of his authority. None of these methods are entirely satisfactory. In my opinion, it is no part of the duty of the public analyst to suggest what samples should be taken, and although this duty may come within the province of the medical officer of health, he has not always that mastery of the technicalities appertaining to the commerce in drugs that is essential to protect consumers without causing hardship to suppliers.

These considerations apply with still greater force to inspectors

and lay members of Sanitary Committees, and undoubtedly there have been many hard cases, in which by the caprice of some person or persons unknown, respectable traders have been called upon to answer charges of a quasi-criminal nature, and ostensibly affecting their commercial integrity, whereas the fault, if any, has been of a purely technical kind, or, it may be, as in the case of many sellers of diluted mercury ointment, is of the quality rather of a virtue.

It must always be remembered that to prove an offence under Section VI of the Sale of Food and Drugs Acts, 1875, no guilty knowledge need be alleged, and, moreover, a master is responsible for the acts of his servants, even though these be against his express instructions, and also for those of strangers, such as railway servants, who may tamper with an article in the course of its transit to the buyer.[1]

Although seemingly harsh, this rule of law is essential for the protection of consumers; for the Act of 1872, under which knowledge had to be proved to obtain a conviction, was found to be almost inoperative, whereas since the 1875 Act came into force, the percentage relation of adulterated samples of drugs to the number of samples taken has gone down from twenty-two in the quinquennium 1877–1881 to 8·5 in the year 1911–12.

It remains, however, a grievance that such matters should be tried in petty Criminal Courts, the unfamiliar and distasteful atmosphere of which too often seems to hypnotise accused traders to a degree which prevents them adequately presenting a correct narrative of the facts.

This has been recognized even in official circles, and in 1907 the Board of Agriculture in their annual report suggested that it might be provided that if any sample taken under the Sale of Food and Drugs Acts by an officer of a local authority is found to fall below the standard of quality, the vendor should on demand pay to the local authority whose officer caused the sample to be analysed a specified sum of money.

This sum should, if necessary, be recoverable in the County Court, so as to free the procedure from the objectionable atmosphere of a Criminal Court.

One is not sure, however, whether this change would not be for the worse rather than for better.

[1] *Vide* Betts *v.* Armsted, 58 L.T. 812; Brown *v.* Foote, 66 L.T. 649; Parker *v.* Alder, 79 L.T. 381.

The demanding of penalties privately is a method open to abuse, and although it obtains under Section XVI of the Pharmacy Act, 1868, it is doubtful if such power could be usefully extended to local authorities under the Sale of Food and Drugs Acts.

One small change might, however, be made, namely that a Court of Summary Jurisdiction, when hearing cases brought under these Acts, should be required to sit either in a different building or room from that in which the ordinary sittings of the Court are held, or on different days or at different times from those at which ordinary sittings are held.

But the main endeavour should be to prevent vexatious prosecutions.

Before setting the law in motion, two questions must be answered satisfactorily. First, is the action necessary, and calculated to be useful in the interests of consumers?

This is primary and fundamental, and yet how many prosecutions there have been which would never have been initiated if the facts had been tried by this test!

The second question is subordinate, yet important: will a prosecution so hamper and harass honest traders as ultimately to defeat the ends in view?

These questions must be asked by persons capable of giving an intelligent answer to them, and such are not always to be found amongst the officials, or even the members of local authorities.

Pharmacy is a highly specialized industry, and the laws which govern its practice can only properly be administered by experts. Milk and dairy produce are articles more or less within the ken of every householder, yet it is provided by Section IV of the 1899 Act that the Board of Agriculture may, after such inquiry as they deem necessary, make regulations for determining what deficiency in any of the normal constituents of genuine milk, cream, butter or cheese shall for the purposes of the Sale of Food and Drugs Act raise a presumption until the contrary is proved that the milk, cream, butter or cheese is not genuine or is injurious to health.

Procedure modelled on this should be formulated for drugs.

A Board of Reference has often been suggested, and its appointment is long overdue.

A short Act is needed to the effect that the Local Government Board shall set up a subsidiary board consisting of medical

officers of health, pharmacists and analysts in equal numbers, assisted by expert legal advisers.

It should be the duty of this body to select such drugs as appear to need attention, and to lay down standards to which they should be required to conform.

These standards should be communicated by periodically issued circulars to local authorities, and no local authority should be allowed to take proceedings under Section VI of the 1875 Act in respect of any drug not on the official list, without first submitting the facts to the Board of Reference.

There is some experimental evidence in favour of this plan. About seven years since a committee consisting of members of the Pharmaceutical Society and of the Society of Public Analysts was set up for the purpose of advising public analysts on questions of complexity and difficulty concerning drugs, which might arise from time to time.

It has not transpired to what extent this committee has carried out its object, but whether *post hoc vel propter hoc*, there has been a distinct improvement in recent years, and fewer prosecutions of doubtful utility and positive hardship. The members of the committee would, however, be the first to agree that their position is not comparable to that of an official body.

There is one other method, distinct from new legislative proposals, by which pharmacists can protect themselves from the pecuniary penalties, and the mental and moral damages incident to proceedings under the Sale of Food and Drugs Acts.

Primarily, of course, the best guarantee of quality is the due exercise of the skill and knowledge which a pharmaceutical qualification predicates, but whereas pharmacists are not now able with advantage to manufacture all the products in which they deal, it may well be that they may choose to avail themselves of the protection afforded by Section XXV of the 1875 Act as modified by Section XX of the 1899 statute.

These are the warranty sections under which a defendant who is able to prove that he purchased the article in question as the same in nature, substance and quality as that demanded of him by the purchaser, and with a written warranty to that effect, and that he had no reason to believe at the time when he sold it that the article was otherwise, and that he sold it in the same state as when he purchased it, must be discharged.

As to what is a written warranty within the meaning of these sections there has been much forensic discussion.

A terse and recent authoritative decision is that of Lord Alverstone, C.J., who in a judgment delivered in 1910 in the case of Draper *v.* Newnham (74 J.P. 124) said :—

This is the safe test, that if on the face of the document it can be seen that it refers to the consignment in question, then there is a sufficient warranty in writing.

The following formula impressed on the face of an invoice and signed in writing by the supplier or suppliers or some person authorized to sign for him or them, has been used for some years, and would appear to be a suitable form of warranty as between the wholesale and retail drug trade.

I/we guarantee that all pharmaccpœial preparations herein named correspond to the descriptions and conform to the standards of the British Pharmacopœia, 1898, at the time of sale, and that all other articles are genuine as described.

At the best, penal Acts can never be other than clumsy precautions for ensuring purity ; the real safeguard for the supply of genuine medicaments being now, as always, the maintenance of a properly trained, efficiently educated and adequately remunerated class of suppliers, inspired by personal and corporate traditions of honour.

THE OPERATION OF THE SALE OF FOOD AND DRUGS ACTS FROM THE POINT OF VIEW OF THE WHOLESALER

By C. A. Hill, B.Sc., F.I.C.

The printed programme for the Jubilee Meeting states the second of the four points of view from which this discussion is to be opened as that of the "Wholesale Pharmacist," but the Editor of *The Pharmaceutical Journal* (*P.J.*, June 14, page 834) says that this title is an abomination—presumably the double rôle of manufacturer and wholesale vendor is intended. The wholesaler is concerned with the Food and Drugs Acts from every point of view, but when the points of view of the lawyer, the pharmacist, and the public analyst have been deducted, there is not so very much left that is peculiar to the wholesaler.

The manufacturer quâ manufacturer is quite willing to produce his commodities according to any standard that may be agreed upon between himself and his buyer—i.e., to sell to any specification, and to base his prices accordingly. Wholesale druggists

are themselves manufacturers of many of the things which they sell, but in these cases the rôle of the manufacturer is apt to become lost in the more engaging responsibility of the wholesale vendor; and the latter function alone is to be considered in the case of those articles which the wholesaler does not himself manufacture but buys in large quantities from the manufacturers and re-sells to the pharmacist. Therefore, it seems that I need only open this discussion from the point of view of the wholesale vendor.

There was probably a time when the wholesale druggist was a wholesaler pure and simple, buying his commodities in bulk quantities, breaking bulk, and re-selling in smaller quantities. There was no analytical laboratory, no guarantee, no British Pharmacopœia, no Food and Drugs Act. How far we have progressed since that time, and how different is the state of affairs to-day one need not stop to consider.

"The British Pharmacopœia as a Standard" was the title of a paper read before this Conference in London in the year 1900, and has been so fully and so ably dealt with by Mr. Dott, Mr. Gadd, and others, that I propose in my few remarks entirely to omit discussion of this question.

In the year 1905 an extended and extremely interesting discussion took place on the question of warranties, in which a fair amount of ground was covered by a number of writers of whom our President was the most prolific. The correspondence set forth very adequately the arguments for and against warranties, the position of wholesale druggists, and the possible effect on the pharmaceutical status. In my own contribution to this discussion, I pointed out that the wholesaler was ready to stand by the goods which he sells, either with or without a legal warranty, and asked, "What would the retailer think of the wholesaler who, in turn, said, 'I did not make this chemical, I bought it from Germany. I did not test it before sending out, I bought it with a guarantee.'" Mr. J. C. Umney, quoting these words, said, "This is the crux of the whole position. The wholesaler does take all responsibility for the goods he sells. There are many chemicals of which he is not a manufacturer, but in every instance the scientific, up-to-date, semi-professional (if I may use the word) wholesale druggist examines these and takes on his own shoulders the full responsibility, not relying on the warranty of any one."

I have quoted the above as illustrating the position, but, incidentally, it indicates also the *raison d'être* of the wholesaler.

As a manufacturer his *raison d'être* is obvious; while, by virtue of his buying, sorting, bulking, sampling, analysing, and occasionally rejecting, he becomes a kind of clearing house between the pharmacist and the producers, the latter of whom are frequently foreigners, not amenable to the Sale of Food and Drugs Acts.

The tendency to put commercial qualities of common chemicals to uses for which they are neither intended nor fitted (i.e., pharmaceutical uses) is to be severely deprecated. It is fraught with danger to pharmacists, as is shown by the Birmingham prosecutions relating to arsenical borax.

There is a question asked of wholesalers sometimes with nauseating iteration: "Is your commercial quality of so-and-so B.P.?" Probably what the questioner really means is: "Will it fulfil the requirements of the Food and Drugs Act?"

How can the wholesaler fulfil his proper function, such as I have briefly indicated, and sell a commercial quality of a chemical as B.P.? In order that he may be in a position, with due regard for his reputation and his pocket, to guarantee such an article as borax, for instance, and I can think of no better example, it is clearly necessary that each cask should be sampled and submitted to thorough analysis. It is not sufficient to take one package as representing a consignment and assume that the consignment is homogeneous, for I have known in one consignment arsenic in borax range from $2\frac{1}{2}$ to 40 parts per million, and lead in boric acid from 1 to 45 parts per million; and even now we have not considered the possibility of the contents of a single cask varying. Writing in the *Chemist and Druggist* of July 5, I stated that "wholesale druggists cannot with reason be expected to sample and analyse and guarantee every cask or package of a commercial article bought and sold at the price proper for a commercial quality." Moreover, the wholesaler is faced with a further difficulty, for the pharmacist places upon him the onus of forming his own estimate of what will answer the Food and Drugs Act, and (assuming the Pharmacopœia to be the standard) to interpret what will be held to be in compliance with the unexpressed or ill-expressed intentions of the compilers of that work. It is this lack of definite knowledge as to what really is the standard which has made vexatious prosecutions possible.

What worries a wholesaler is not compliance with a severe standard, but compliance with an unknown standard; what we ask for is definiteness.

This is the Food and Drugs Act as it appears to me from the wholesaler's point of view.

In order to remedy this state of affairs pharmaceutical manufacturers (if this title be permitted) have, out of self-defence, as much as from altruistic considerations, given much time towards recommendations for the forthcoming edition of the Pharmacopœia, which are all in favour of greater definiteness. The formula "guaranteed B.P." may then have a meaning—at the present time it is impossible to say, in many cases, what constitutes the standard "B.P." Moreover, as things are now, a substance may fulfil the requirements of the Pharmacopœia and not those of the Food and Drugs Acts. Personally, I am not in favour of too stringent requirements, but if by any chance they are made too stringent, surely the retail pharmacist is the last person who ought to complain, rather the wholesaler who has to find such products and the manufacturer who has to produce them. It may be pointed out that a large number of tests in an official monograph does not necessarily involve greater stringency; it does not mean that the pharmacist is to be called upon to supply a substance fulfilling the ideals of some visionary dreaming in an armchair; but what it does or should mean is that the proper substance has been carefully and adequately characterized. The desirability of having Pharmacopœial limits fixed for an impurity such as arsenic is brought home when one considers that, in the absence of an authoritative standard for drugs, a proper limit for arsenic in some undoubted drugs might be held to be 1/100th grain per lb. (1·4 parts per million)—the accepted recommendation of the Royal Commission on Arsenical Poisoning—on the ground that they enter into articles of food.

With the inclusion in the Pharmacopœia of definite standards of purity vexatious prosecutions in official articles should become impossible. Let me hasten to assure Mr. Hinks, who follows me, and other public analysts, that I am not imputing any fault to them by the use of the word "vexatious," and I will recall one instance which came directly under my notice in which a pharmacist was called upon by the local authority to explain the sale (made under the Act) of cream of tartar which was certified by the public analyst to contain lead to the extent of 1/70th of a grain per lb. (2 parts per million)—as showing what injustice can be done by a false interpretation of a public analyst's certificate by the municipal or lay mind.

Concentrated Galenicals.—I would like to put the position of

the wholesaler with respect to concentrated galenicals as somewhat reluctantly fulfilling a somewhat embarrassing demand, but I fear that this view could not be entirely justified.

Concentrated infusions and decoctions are now so familiar that one is apt to lose sight of the small departure from rigid accuracy involved (i.e., the unauthorized addition of alcohol) in using them in place of the freshly prepared official preparations which they are intended to represent; for, although "nine of the more successful have been admitted into the Pharmacopœia as '*Liquores Concentrati*,' and the products of their dilution with water may be prescribed by practitioners in place of the corresponding official infusions" there is no licence to make such dilution *in situ* when the fresh infusion figures in a prescription.

The demand for concentrated preparations arises from considerations of convenience, for, theoretically, they should work out somewhat more expensive than the official preparations. Some concentrated infusions very fairly represent the fresh preparation, and when they contain at least 20 per cent. of alcohol (by volume) they keep well, but considerations of cost have led to the appearance of very inferior and undesirable preparations, not only decoctions and infusions, but tinctures also.

The demand for concentrated tinctures for export purposes is reasonable, seeing that there may be a considerable saving in expense effected by importing tinctures in this form into countries where the duty on spirit per liquid gallon is very high, but for home trade it is difficult to see any valid reason, for if properly prepared they must work out more expensive than the B.P. tinctures.

It is not uncommon for a manufacturer to be asked to supply a liquor concentrated 1 to 7 when 1 to 3 or 1 to 4 is the utmost degree of concentration possible, and it is to be feared that such abnormalities are not unknown in wholesale price lists.

Now, in many cases the preparation resulting upon dilution of its concentrated form is deficient in flavour, aroma, or other qualities, while in some there are ingredients amenable to chemical determination. Prosecutions have taken place in respect of dec. aloes comp.—either improperly prepared or improperly diluted—and the present-day excessive demand for concentrated galenicals, and its relation to the subject of this discussion, certainly seems to invite careful reflection.

I shall doubtless be expected to make some reference—the question of warranty quite apart—to the delicate possibility of

direct conflict between the seller and his wholesale supplier on a question of fact, and such a conflict might occur between parties of unimpeachable integrity, owing to a *bonâ-fide* mistake; the retailer might unintentionally impute liability to the wrong wholesale house. That such conflicts are, if I may say so, unknown is surely a matter for congratulation, and a good testimony to the excellent relations existing between these two sections of the craft.

I believe I am correct in assuming that if a retailer receives a summons in respect of a sale made under the Food and Drugs Act, and states that he purchased the article from a certain wholesaler, and can show that he has received a supply of that article from that wholesaler, that is *primâ facie* evidence of the truth of his contention, and that the onus of disproving it falls upon the wholesaler. Were such a case to arise, the wholesaler would doubtless rely upon his analytical records and other books to show the quality of the article which he actually had supplied to the retailer.

Again, a dispute between wholesaler and retailer might quite conceivably arise if the retailer purchase a standardized galenical preparation and prepare from it another official preparation, and the latter become the cause of a summons under the Food and Drugs Act. Suppose, for example, tinct. ferri perchlor., P.B., be purchased by an inspector under the Act, and be found, upon analysis, to be deficient in iron, the pharmacist may be inclined to lay the blame upon the liquor ferri perchlor. fort. purchased from his wholesaler, affirming that he prepared the tincture by dilution of the liquor in strict accordance with the directions of the Phamacopœia. Other and similar instances will readily occur, such as vinum ipecac., made from ext. ipecac. liq. and tinct. nucis vom. from ext. nucis vom. liq.

The question of deterioration sometimes arises, and has to be considered as in such articles as spt. æther. nit., hydrogen. peroxid. ammon. carb., pulv. rhei co., Blaud's pills and certain essential oils, and it is here that one might expect a possible source of dispute between wholesaler and retailer. Here again the wholesaler would have to rely chiefly upon circumstantial and well-authenticated analytical records. It is to be noted that, when relying upon a warranty, the onus lies upon the seller to prove that the article sold is in the same condition as when received.

THE OPERATION OF THE SALE OF FOOD AND DRUGS ACTS AS IT AFFECTS THE PRACTISING PHARMACIST IN RETAIL BUSINESS

By J. P. Gilmour

While I had a due sense of the honour of the invitation from the Executive Committee to deal with this department of the subject set down for discussion here, it was with some diffidence that I undertook the duty, because, as a Scottish pharmacist, carrying on business in Scotland, I have already had occasion to record publicly that "as prosecutions of pharmacists in Scotland under the Food and Drugs Acts are almost unknown, it is evident that the article of maintaining uncompromisingly the principle of purity in medicine for which the British Pharmaceutical Conference stands, is there more honoured in the observance than in the breach." This paucity of prosecutions, however, is not to be construed as meaning either that the Public Health Authorities in Scotland are supine in their administration of the Acts, or that the Scottish practising pharmacist is righteous above what is written, or is a superior moral person to his *confrères* south of the Border. As we shall learn later, the phenomenon is capable of a simple but sufficient explanation. In lieu of adequate personal experience of the working of the Food and Drugs Acts in relation to the practising pharmacist in business, I sought enlightenment on the subject from English, Welsh and Irish pharmacists, to whom I addressed, by circular letter, and through the courtesy of the editors of the official and trade journals, a set of inquiries. The response was liberal and helpful beyond my expectations. Even from Scotland I had communications which bore that in parts of that favoured land the conditions were not quite so paradisaical as I had fondly believed. Ireland alone was silent, so that apparently for once there is no grievance in that quarter —not that when we exchange fiction for fact the Irish people are any more hypochondriacal than the rest of us.[1] It is impossible here to make categorical acknowledgment to all my correspondents, who have also been virtually my collaborators in the compilation of this paper, for the defects of which, however, I only am responsible.

The operation of the Food and Drugs Acts affects the practising pharmacist in retail business in respect of:—

[1] Subsequent to the date of writing this sentence, a report was received from Mr. W. F. Wells, Dublin, the purport of which showed that the conditions in Ireland are similar to those in the other parts of the United Kingdom.—J. P. G.

I.—The collection of samples of drugs for analysis.

II.—The selection of samples.

III.—The standards of strength and purity for drugs imposed by judicial interpretation and ruling regarding the statutory expression, "To sell to the prejudice of the purchaser any food or drug which is not of the nature, substance and quality demanded.

IV.—Prosecution procedure and court practice.

The Collection of Samples.—There are not sufficient data for statistics of the frequency with which samples are taken, informally or officially, from each retail pharmacy, in each district. As regards the manner in which the food and drug inspectors perform their somewhat invidious duties, it is reported on favourably from all parts of the country. But a Scottish correspondent suggests that it would be better if the inspector procured and divided the sample into three portions out of sight of the customers in the front shop, some of whom may be apt to suspect that there would be no official visitation unless there had been some complaint against the pharmacist.

The Selection of Samples.—An analysis of the composite lists which I have compiled from the local lists supplied to me shows that in the order of frequency the drugs selected for sampling may be divided into three groups, viz., (1) constants of higher frequency, or drugs common to all the contributing lists; (2) constants of lower frequency, or drugs common to some of the lists; (3) casuals, or drugs occurring only once on a few lists. These three groups are tabulated as under:—

Constants of Higher Frequency.—The relative frequency is determined in the usual way by dividing the lowest frequency into the higher ones. The distributive frequency is as between the different burgh and county areas included in the survey.

Name of Drug.	Relative Frequency.	Name of Drug.	Relative Frequency.
Acetum Destillat.	1·0	Piper Alb. et Nig.	2·0
Arrowroot	1·6	Potass. Tart. Acid	3·0
Citric Acid	1·0	Prescriptions	1·0
Easton's Syrup	1·0	Pulv. Glycyrrh. Co.	1·0
Ext. Cascar. Sag. Liquid.	1·0	Pulv. Rhei Comp.	1·3
Glycerin	1·0	Pulv. Seidlitz	1·0
Honey	2·0	Spt. Æth. Nit.	2·0
Lin. Camphoræ	3·0	Tartaric Acid	1·0
Magnesia Calcin.	1·3	Tinct. Camph. Co	1·0
Milk of Sulphur	2·6	Tinct. Iodi	1·6
Ol. Morrhuæ	1·6	Tinct. Opii	3
Ol. Olivæ	2·0	Tinct. Quin. Ammon	2·0
Ol. Ricini	1·3	Ung. Hydrarg. Ammon.	1·0
Pil. Hydrarg.	1·0	Vin. Quininæ	1·0

Total number of drugs in this class, 28; official, 25; unofficial, 3.

Constants of Lower Frequency.—All of equal frequency—1·0.

Adeps Præparata	Ol. Santali
Boracic Acid	Saffron
Linum Contusum	Spt. Camph.
Liq. Calcis	Tinct. Rhei Comp.
Milk Foods	Ung. Ac. Borici
Mineral Waters	Ung. Hydrarg.

Total, 12; official, 11; unofficial, 1.

Casuals.—All of equal frequency.

Acetum Vini Alb.	Potass. Bromid.
Ammon. Carb.	Potass. Iodid.
Beef Juice	Potass. Nitrat.
Calcii Acid Phosph.	Pulv. Capsici
Calomel	Pulv. Cinnamon.
Carbo. Ligni	Pulv. Rad. Gentian.
Cera Flava	Pulv. Ipecac.
Chloride of Lime	Pulv. Rad. Rhei
Chloroform	Pulv. Zingib.
Coconut Oil	Quin. Hydrochlor.
Ext. Cinchonæ Liq.	Quin. Sulph.
Ext. Ipecac. Liq.	Sacch. Lactis
Ext. Malti Liq.	Salad Oil
Ferri et Quin. Cit.	Sem. Papaver.
Fluid Beef	Sodii Biborat.
Fuller's Earth	Sodii Bicarb.
Hydrarg. Oxid. Rub.	Sodii Carb.
Isinglass	Soda Tartarata
Liq. Ammoniæ	Sodii Sulph.
Liq. Arsenicalis	Spt. Ammon. Arom.
Magnesii Sulph.	Spt. Camph.
Mist. Sennæ Co.	Spt. Vini Gallici
Mustard	Spt. Vini Rect.
Ol. Amygdalæ	Sulphur Sub.
Ol. Anisi	Syr. Ferri Phosph. Comp.
Ol. Eucalypti	Syr. Scillæ
Ol. Gossypii	Tinct. Arnicæ
Ol. Terebinth.	Tinct. Benzoin. Co.
Opium	Tinct. Rhei Co.
Oxymel Scillæ	Tinct. Scillæ
Paraldehyde	Tinct. Sennæ
Peptonized Beef Jelly	Troch. Ac. Tannic.
Pil. Ferri Carb.	Ung. Ac. Carbolic.
Pil. Hydrarg.	Vin. Aurantii
Potass. Bicarb.	Vin. Burgundicum

Total, 80; official, 71; unofficial, 9. Aggregate total, 120; official, 107; unofficial, 13.

It will thus be seen that in an area extending from the North of Scotland to all parts of England and the North of Wales, the selection of samples is approximately confined to B.P. drugs and preparations, a circumstance which considerably simplifies

the issue in the battle of the standards. It is also noteworthy that the aggregate total of 120 drugs in the above lists represents 13·12 per cent. of the grand total (815) of the B.P. drugs and preparations. It is not for me to supply the *rationale* of this restricted range of selection, for which there may be ample sanction irrespective of that force of routine of which we all are creatures.

Drug Standards.—All my correspondents, with one exception, approve of the British Pharmacopœia as a standard for pharmacopœial drugs and preparations. The exception is of opinion that the B.P. bristles with technicalities which have the effect, either by design or accident, of trapping wary as well as unwary pharmacists. He suggests that, before final revision, proof sheets of the next B.P. should be submitted to local associations, so that it may be adjusted to the everyday requirements of the pharmacists behind the counter.

The B.P. as a standard is only accepted, however, with certain reservations. The general view is that it should apply solely to pharmacopœial drugs, etc., for medicinal use. But not to similar substances for economic use, e.g., ammon. carb., chloride of lime. There is also a strong objection to the acceptance of B.P. tests and requirements as decisive in cases where it is demonstrable that these are inaccurate or inadequate, e.g., ol. juniperi, ol. olivæ. And finally, there is an even stronger feeling against the unconscionable stringency of the standard for the limits of lead and arsenic, which seem to be based on an estimate for the consumption of beer, rather than of drugs, which are used in what by comparison are infinitesimal quantities. This is a refinement which presumptively affects the manufacturer more than the practising pharmacist in business, but as witnessed by the Hanley prosecution, the latter may be unfortunately involved in this connection.

There is opposition on all sides to the multiplication of standards, unless these are definite and authoritative. And for this purpose they would have to be devised by an as yet non-existent statutory board of experts, which may or may not be potential in the slowly gestatory womb of time. For the present, tentative standards, e.g., those based on laboratory records as to the percentage of solid extractive in tinctures, etc., should not be recognized as authoritative in prosecutions under the Food and Drugs Acts.

SCHEDULE showing the number, etc., of Drug Samples collected by the Public Health Department in an Urban District with a population of 800,000, served by 200 retail pharmacies and 175 drug shops, for the Quinquennium, 1907-1911 :—

Article.	Collection.		Total.	Adulterated.	Convictions.
	Informal.	Official.			
Arrowroot	—	64	64	—	—
Beef juice	2	—	2	—	—
Castor oil	2	—	2	—	—
Citric acid	—	1	1	—	—
Cod-liver oil	1	—	1	—	—
Cream of tartar	—	114	114	6	1
Essence of beef	3	—	3	—	—
Extract of malt	11	—	11	—	—
Fluid beef	4	—	4	—	—
Ground ginger	—	95	95	—	—
Honey	1	—	1	—	—
Lard	—	110	110	1	1
Linseed, crushed	—	68	68	—	—
Malt vinegar	—	23	23	—	—
Milk of sulphur	—	48	48	1	—
Mustard	—	2	2	—	—
Camphorated oil	—	79	79	5	2
Olive oil	—	53	53	1	—
Salad oil	—	3	3	—	—
Peptonized beef jelly	1	—	1	—	—
Quinine wine	1	3	4	—	—
Spt. Æth. Nit.	—	6	6	1	1
Tartaric Acid	—	87	87	1	1
Tinct. Iodi	—	30	30	7	5
Totals	26	786	802	23	11

Average number collected per annum	112·28
Percentage adulterated	2·86
Percentage of convictions on total number of samples officially taken	1·4

Prosecution Procedure and Court Practice.—Having regard to the large number of samples taken informally and officially from pharmacists in the United Kingdom the *percentage* of prosecutions is very low, and what is still more gratifying the ratio of convictions to prosecutions is also small. The preceding table, which may be accepted as typical of the conditions throughout the country, is instructive in this respect. The case for the pharmacist would show to even more advantage if it were possible to

segregate the samples of drugs taken from unqualified drug-store keepers and grocers, from those taken from retail pharmacists. But none of the records available make this subdivision.

Court Practice.—In Scotland cases under the Food and Drugs Acts are heard before a stipendiary magistrate sitting in the police court, or before a sheriff—the Scottish equivalent to an English county-court judge. As, owing to the redundant judicial wisdom of the sons of the tribe of Bailie Nicol Jarvie in Scotland, they have no use for professional police-court judges, there is only one stipendiary in Scotland, who has his court in Glasgow. Therefore the few cases that are heard are invariably taken before the sheriff. But the English practice of taking these cases in the police court is keenly resented by many of my correspondents, who consider it an indignity—one goes so far as to say an ignominy—to be haled before a court which is mainly concerned with paltry or sordid police offences. These remonstrants demand a reform of court practice in this respect. So that the defendant should not be treated as if he were a petty criminal, but rather as if he were defendant in a civil action.

Analysts' Certificates.—There is complaint of occasional lack of specification in these. It is suggested that before any proceedings are taken the second sample in the possession of the public health authorities should be sent to Somerset House for analysis; a prosecution only to take place if the results of the two analyses are concordant. When this has been done at the request of the defendant, it has frequently happened that the Somerset House certificate has vindicated the purity of the sample.

Expenses.—It is felt to be a great hardship that when the prosecution fails or the summons is withdrawn the defendant must, nevertheless, pay his own costs. In a recent case in the North of Scotland, although the defendant was acquitted on a Somerset House certificate, he had to defray the costs of the defence, amounting to £17 11*s.* 1*d.*, besides having to bear all the suspense and notoriety associated with the proceedings, for which even the payment of his expenses by the prosecutor would have been no compensation. It might not be expedient to allow expenses to the acquitted defendant under all conditions, but the judge ought to have discretionary power to treat every case on its merits, so that the innocent may not be penalized.

General Considerations and Conclusions.—A review of the situation as revealed by the foregoing statement drives one to the conclusion that for the great body of practising pharmacists in

retail business the Food and Drugs Act might be a statute of Mars. This is so because (1) the conditional acceptance by the Bench of the invoice warranty has relieved the pharmacist of personal responsibility; and (2) because, whether we deplore it as a diagnostic of degeneration or hail it as a presage of progress, a yearly increasing number of practising pharmacists in the retail business now buy in their galenicals, even unto camphorated oil and lime water, instead of making them on the premises. Accordingly the pharmacist sits secure in fancied impregnability, fortified by paper battlements of invoice warranties and insurance policies, which may shelter him from the assaults of the enemy, and even enable him to repel them, and win him a war indemnity; but what indemnity is there for the havoc wrought upon a good name and the loss of business which even victory often entails? The public has a long memory for evil, real or imputed. I recall a case in which, twenty years after a fatal poisoning accident, due to a dispensing mistake in a doctor's shop, people passing the door would still point the finger of warning at it. The only effective safeguard for the practising pharmacist in the retail business is a profound sense of personal responsibility and a sedulous exercise of it. In conclusion, I venture, at the disadvantage of repeating myself, to quote a passage from a paper on "The Officinal Testing of Drugs and Chemicals," which I read at the meeting of the Conference in Manchester in 1907: "It is doubtful whether the conscience of the pharmacist is always as sensitive as it ought to be to the solemn moral obligation that rests on him or her to be satisfied personally of the genuineness, activity, etc., of all officinal drugs and chemicals, official or non-official, taken into stock. It is not that adulteration is more rife than formerly; on the contrary, in consequence of the growth and development of a higher code of commercial morality, combined with increased stringency in the enforcement of the Food and Drugs Acts, gross sophistication has become infrequent. But neither this amelioration nor any system of guaranty nor warranty, however efficient, can absolve the prescriber-cum-dispenser, or the dispenser *per se*, from the responsibility of personally authenticating the materials which he handles, if only on the somewhat mean prudential principle of self-preservation."

THE OPERATION OF THE SALE OF FOOD AND DRUGS ACTS IN RESPECT OF DRUGS

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When considering the Sale of Food and Drugs Acts, it must be allowed that we are considering Acts of Parliament highly beneficent, though, naturally, not perfect; Acts which during the last thirty-five or forty years have been of immense benefit to the people of this country. If one reads the works written on the subject of food and drugs before, or shortly after, the passing of the parent Act in 1875, one gets an idea of the extensive nature of adulteration in those days. It must be remembered, too, that at the time when the first Acts were passed, the resources of the person intent upon adulteration were comparatively limited. With the enormous extensions of knowledge and of the arts of industry upon which the adulterator can now draw, it is difficult to realize what would be the state of affairs at the present time if it were not for the operation of these Acts. In short, these Acts, and an extension of them, are imperatively needed.

Adulteration is not a new art; it is a very old one, changing with the times. In a more or less scientific age, adulteration is more or less scientific. In these days, when one reads many sensational statements as to the danger lurking in our foods, and, possibly, in our drugs, it is wholesome to remember the old days, and to know that, as a fact, matters are improving. Adulteration was always a fraud, and it still is, but it is becoming less and less a danger to health, excepting, however, the danger of the extended use of preservatives.

It is difficult to speak of these Acts from the point of view of a public analyst without encroaching upon the ground allotted to other speakers. To a large extent, those concerned with them, in whatever position, are confronted with the same difficulties.

Looked at strictly from the public analyst's point of view, the Acts, in respect of drugs, can be narrowed down in the majority of cases to Section 6 of the 1875 Act, that no person shall sell to the prejudice of the purchaser an article not of the nature, substance and quality demanded. This leads at once to the question of standards and to the vexed question of the Pharmacopœia.

It is, I think, obvious, that with regard to compounded medicines there must be some authority that shall lay down for a given article the proper constituents and their proper proportions. No individual, whether he be a pharmacist, a medical man, a lawyer, an analyst, or even the most judicious blend of all, can do this. No individual can by himself produce evidence that will satisfy a court of justice what is the correct nature, substance and quality of a compounded drug. For many years the only authoritative work, embodying the considered opinion of those who ought to know, was the Pharmacopœia. It is not surprising, therefore, that this work came to be considered by the Courts as affording an important criterion of nature, substance and quality. This may not have been the intention with which the Pharmacopœia was drawn up, but the fact remains that, as the law stands, it is, unless other very strong evidence be adduced, the standard with which drugs named in it must comply. I will say at once, however, though I will refer to the point more fully later, it is not the only authority to which an analyst has regard when framing his certificate.

The Pharmacopœia is a many-sided volume. It attempts many things.

In the first place it defines the origin and mode of production of a number of single substances. A certain oil, for instance, is the oil distilled from or expressed from the leaves, seeds, etc., of a certain species of plant. Here it is on fairly safe ground. In course of time, however, with the development of fresh fields of supply and new methods of production, what is a legitimate article for use in pharmacy may come to be produced not in the manner stated.

Further, it proceeds to state the characteristics of the substance it is describing. Here it is upon very thorny ground indeed. Limits of physical and chemical "constants" must be widely drawn to allow for natural variation, and narrowly drawn indeed if they are to exclude foreign substances and adulterants. After a lengthy inquiry and the hearing of evidence which occupies many hundreds of pages of a Blue Book, a Committee was only able to arrive at certain "presumptive" limits for a natural article, milk. From the nature of the case these limits had to be, for most milks, too low; the exceptional milk will not confine itself within narrow limits. The vegetable kingdom, with which the Pharmacopœia is chiefly concerned, is no less variable than the animal kingdom, and we cannot be surprised that the attempt

to lay down the characteristics for the oils, for instance, of the Pharmacopœia is only very partially successful. An improvement in this respect can be, and must be, made, but we must not expect an impossibility. There is room for the prescribing of a minimum limit for the proportion of constituents that can be estimated. I might give as an example the desirability of stating a minimum percentage of cineol in oil of eucalyptus, in the place of the unsatisfactory semi-quantitative test given.

Further, the Pharmacopœia describes tests of purity, with the object of keeping within prescribed limits, impurities that may be introduced in the process of manufacture. Here there should be little difficulty in arriving at satisfactory limits and tests, but the position as it stands is notoriously unsatisfactory. This question has arisen most prominently in the case of lead and arsenic. It is a long story, with which all are familiar. It is sufficient to say here that the Pharmacopœial tests for these impurities have rightly been thrown over, and we have in their place other suggested tests and limits, notably those in the Local Government Report on the presence of lead and arsenic in citric and tartaric acids and cream of tartar, the Arsenic Commission Report, and the Reports to the Pharmacopœial Committee, and of the Committee of Reference in Pharmacy.

Then we can pass to surer ground again. The constituent parts of compounded medicines are prescribed, and in some cases methods of assay are given. There can hardly be two opinions as to the propriety of this. Tincture of opium should contain the proportion of morphine prescribed in the Pharmacopœia, though we are aware that the method of assay is faulty. It could not be left to the individual pharmacist to decide in such cases what should be the nature of the article he should sell.

I have necessarily omitted many of the points that arise in connection with the Pharmacopœia, and I will sum up the position by saying that what I conceive to be the correct procedure for the public analyst is that, before giving his opinion as to the genuineness or otherwise of a drug, he shall have regard to the Pharmacopœia, but at the same time he shall also have regard to its known faults, to reports such as I have mentioned in connection with lead and arsenic, to other authoritative works such as the Codex, to decided cases on the points raised, to the extent to which drugs are liable to deterioration, to the changes which take place in them during preparation, and to the legitimate error in dispensing—perhaps I ought to add also the experimental

error in his analysis. Lastly, if analysis shows the article to be not what it purports to be, no matter how many official tests it may comply with, the article must be condemned.

The necessity for a work such as the Pharmacopœia must be admitted by all, and the position which it now occupies in relation to the Acts only emphasizes the urgency of its revision and reform. I know, of course, that it is being revised, and I have every reason to believe that in the near future many of my remarks will be invalid.

I need make no apology for having devoted so much time to the Pharmacopœia, but I must pass to other considerations.

For the analyst the greatest difficulty in connection with the Acts is, and will remain, the analysis itself. For the detection and estimation of definite chemical substances there are, for the most part, well-established methods of analysis, giving satisfactory results. For many powdered and mixed drugs, the active principles of which have often not even been isolated in research, there are no strictly analytical methods at present available. The microscope, taste, smell, and so forth, are the only guides; and these, though useful and highly important, cannot lead to any precise quantitative expression. With extracts the position is even worse. Sophistication may be suspected, but cannot in many cases be proved. It may be here remarked that the public analyst, when acting as such, is in a position of greater difficulty than the analyst controlling supplies commercially. A certificate to be used for the purpose of the Acts must set forth the constituent parts of the article analysed or the percentages of foreign ingredients. It is not sufficient to say that the article is inferior, or that it is adulterated, or that it has not the recognized characteristics of the genuine article. This, though a source of great difficulty for the analyst, is a fair provision. Proceedings against a person should be accompanied by a definite charge, in fairness to the defendant and for the guidance of the Court. The only way of escape from the obligation thus justly laid upon the analyst is the legal standardization of all articles. This question of standardization is a highly contentious one, in relation to foods as well; though in some respects desirable, it is dangerous; it would by no means always attain the object in view; it would tend to hinder the development of analytical chemistry; it would, I fear, be an encouragement to the synthetic adulterator. The question cannot be dismissed in a sentence, and is too large a one to argue here.

Another point to which I should like to refer—really a legal

point—is the difficulty which exists of establishing the legality or otherwise of some particular practice, it may be a new one or an old one not previously questioned. In the case of a new one no authority can look forward and prescribe for unborn practices, and so it comes about that, in order to attempt to establish the point, some one has to be prosecuted, and the public analyst may find himself in the position of having to initiate a "test case." This may involve hardship and expense for individuals, and also for the prosecuting authority. No matter how carefully it may be explained that no fraud is imputed to the particular defendant more than to other traders, that the case is taken to test the legality of the trade custom, the proceedings do cast a slur upon the defendant. Moreover, there is great lack of uniformity of decisions—a magisterial decision is not binding, sometimes perhaps fortunately, in other places—what is held to be correct in one county may not be so held in another. As a rule, a Government inquiry only follows a number of cases in the Courts. For many years Commissions and Committees have urged the establishment of a Court of Reference to which could be referred questions of this nature, which would afford guidance to traders, analysts, magistrates, and all concerned. I would here point out that in recent years the Local Government Board has issued many valuable reports prepared by the inspectors of food. These have not the force of law, but in practice their recommendations are, as a rule, accepted by the Courts, and it is only fair to say also have been readily accepted and acted upon by the majority of traders. The only one that touches upon our present subject is the one on lead mentioned previously.

I do not attempt a comprehensive survey of the alterations that are desirable in the Acts, but reference may be made to the need for increased facility for taking samples on delivery and in transit, and the bringing of the wholesale business within their scope. I am not aware that the warranty clauses, which are the source of so much trouble in connection with some foods, are a difficulty with drugs. Proprietary articles and patent medicines are not within the operation of the Acts. They are being inquired into in another place, and it would not be of service to discuss their position until we know what is their fate there.

To turn for a moment to the administration of the Acts, the public analyst is not intimately associated with the actual taking of the samples. To a great extent with milk and butter, and to a lesser extent with other articles, including drugs, intimate

knowledge and study of the district and its traders are necessary; only the inspectors have this. When the analyst has reason to think that special attention should be paid to certain articles, he should, and does, direct the attention of his authority to the matter, and thus, to a certain extent, directs sampling. Sampling has, perhaps, in the past, been too casual, but improvement is taking place in this direction, and the analyst is yearly brought more in touch with the administration of the Acts.

During the last few years drug samples have amounted to 3 per cent. of the total taken under the Acts. It is difficult to say whether this is a correct proportion or not. The percentage of adulteration in drugs—I use "adulteration" in its wide sense, an adulterated article being one that for some cause cannot be reported as "genuine"—is about the same as that reported in the department of foods. In deciding the relative amount of attention that should be paid to the two departments, account is properly taken of the fact that the provision of drugs to the public is in the hands of a particular body of men, of whom we rightly expect a particularly high standard of trading.

This percentage of adulteration has been recently from 7 to 8 per cent., as it stands, a rather alarming figure, which, I hope and believe, does not give quite a correct view of the state of affairs. I should be sorry to believe that if one walks into a pharmacist's place of business, it is only twelve or fourteen to one in favour of one's getting a pure and correct article. The prevalence of adulteration is magnified owing to several causes. All articles classed as drugs are not obtained from pharmacists; trivial faults may be disclosed so that the article cannot be termed strictly genuine, but no proceedings follow, and often the fault is not serious enough even to justify a "caution"; there are, at times, a number of samples taken applying really to only one offence. On the other hand, there may be sophistication that goes undetected, and the fact that many, and, at times, most serious delinquencies are disclosed, is, in itself, a justification of the Acts.

I have spoken primarily from the point of view of the public analyst, but have endeavoured to be fair to all points of view. I claim that the Acts in respect of drugs are necessary; that, although alterations are required, they have done great service; that they are administered without harshness, and that, while affording protection to the consumer, they give it also to the honest trader.

Discussion

Dr. J. C. McWalter considered that the Acts for securing purity of drugs at the present time had been rather severely dealt with. He did not consider himself an old man, but fifteen years ago, when he attended the first Conference, the standard of purity of drugs was far below what was now the case. But he feared that the improvement was not due to the greater delicacy of the pharmacist's conscience. The standard of purity of such drugs as lime water, spirit of nitrous ether, cream of tartar, camphorated oil, liquorice powder, was now much higher than formerly, therefore the Acts should not be blamed too seriously. A serious matter had now come into their sphere, and that was the production of cheap drugs for the purpose of Insurance Act prescriptions. That might take from the ordinary retailer his great shield in dealing with the wholesaler, whom he could rely upon to see him out of his trouble. The cheapness of drugs would, he feared, have the result of lowering their standard. None of the four speakers who opened the debate had said anything about bacteriological purity, but all would agree that if alleged distilled water or rose water were bacteriologically impure and were sold by the chemist, he would be responsible.

Mr. T. Maltby Clague desired to deal with the point in Mr. Gilmour's conclusion, that the defendant must pay his own cost, whatever the result. In England there might not be the same excess of local wisdom which was said to exist in Scotland, but there was a fair predominance of common sense and fairness; and in one instance where the inspector and the public analyst were obviously wrong, the costs were given against them, and the defendant was never asked to pay them at all. The inspector did not pay the costs; that he knew. The income-tax assessor for the district would probably be able to say what the public analyst did.

Mr. H. Kemp said he perhaps took more than the average interest in this subject. As a retail chemist it had been his pleasurable experience to be visited by inspectors on three occasions, but there was an interval of twenty-three years between. Yet when he became a representative on the city council, some kind friend evidently suggested it would be well to catch him, for within a fortnight of his election the inspector took three samples of drugs. He had not yet received the results of those analyses. The point he wanted to make was that the Acts were hedged about with difficulties on the part of the administrators, the

analysts, and the retailers, and his experience led him to the view that the Acts required revising and bringing up to date. Some things which had been condemned by authorities should be removed, and hardships which had been inflicted in the past should be made impossible in the future. It must be remembered that the public analyst in different districts was paid on a different scale, and in many districts it was to the interest of the public analyst to refuse, as much as possible, any difficult problems which were brought before him. It had been his duty to draw the attention of the local authority to a number of instances in which paregoric and other preparations supposed to contain opium were being openly sold by unqualified traders without opium in them. The Pharmaceutical Society could not take action against them for the sale of poisons. The next course was to ask the local authority to take proceedings under the Food and Drugs Acts for the sale of drugs which were not of the nature demanded. He was then requested to have an interview with the Chairman of the Sanitary Committee of the city, who was astounded that the material had been sold broadcast under the name of paregoric. When he, the speaker, pointed out the serious mischief which might result from a mother dosing her child from an unopiated preparation in one instance and opiated in another, he said it must be stopped, and the inspectors were put on to the matter. But he learned after a time that they had been unsuccessful in obtaining a single case on which the authorities could proceed. He therefore took steps himself and obtained six of these samples which did not contain a trace of opium. But when one considered the methods adopted by the ordinary inspector the facts need cause no great surprise. He entered the shop and presented a perfectly clean bottle, with a clean cork, and said, "Will you give me two ounces of paregoric elixir, please ?" The shopkeeper immediately suspected something unusual and replied, "We do not keep it." The man who went for the sample could not say he did keep it, and must leave the shop without his sample. On applying to a chemist he was, of course, supplied with it and the report on that was that it was genuine. The conclusion arrived at by the sanitary authorities was that adulteration was not rife, a conclusion which proved to be a wrong one. With regard to the question raised by Mr. Gilmour, there was something to be said on the other side : the public authorities frequently knew that a man was selling adulterated articles, but the difficulty lay in proving a case to the satisfaction

of the Courts, and then the man got off cheaply by perhaps having to pay only his own costs.

Mr. F. E. Bullen desired to discuss the matter from the point of view of a member of the general public. To his mind, the administration of the Sale of Food and Drugs Acts was incomplete because it did not deal necessarily with the distribution of foods and drugs but was restricted to their sale. Probably there were more adulterated drugs distributed free than were sold, and it was a great hardship on those pharmacists who felt they were sometimes unwilling agents in such distribution. The law should be so amended that the officers should have access to wherever foods and drugs were being distributed. It was perhaps more important that the pauper and the hospital patient should have pure drugs than the person who was able to buy them over the counter. A very important matter was the ignominy which the pharmacist had to suffer if samples of his drugs were taken for analysis. If that happened in, say, a suburb of London, the local newspaper got hold of it and made a lot of it, and though the pharmacist probably went into Court fortified with a warranty from the best house in London, yet the name of that firm was not even mentioned in connexion with the case and no proceedings were taken against the firm who supplied the article. A friend of his sold some beeswax, and when he did so his heart misgave him, and he sent to the wholesaler questioning the purity of it. The reply of that gentleman was that so far as he knew it was pure beeswax; they bought it direct from the people who kept the bees, but they had discovered that by stirring up the beeswax with paraffin candles they could produce a very satisfactory article. They said they could not analyse 4 or 5 tons, but they took their samples; and there the matter ended for the retailer, who in the case of a prosecution would have to bear the brunt of police-court proceedings. His purpose in rising had been to urge the need for control in the distribution as well as the sale.

Mr. E. W. Pollard asked whether public analysts had in their mind or practice any limit within which no prosecution would follow? He believed many considered that 10 per cent. was the allowable limit of inaccuracy. He knew of a case where a man went for a sample on a Saturday night to a shop full of people, and he insisted on waiting for it. He wanted ½ oz. of iodide of potassium in an 8-oz. bottle. It was perhaps carelessly dispensed, and to go in for it like that in a busy time and wait for

it was too much like a catch. It was also reported that of six samples not one was accurate; they varied from 3 per cent. to 14 per cent. from standard. He maintained that one could not get an accuracy within 3 per cent. in ordinary rapid dispensing, especially under the Insurance Act. In fact, the strengths in ordinary dispensing could not always be got within less than 5 per cent. Was there any agreement as to the limits allowable?

Mr. R. A. Robinson, junr., remarked that it had been said by Mr. Gadd that the local authorities were not the ideal people to decide what drugs should be taken for analysis. He did not say that was wrong, but he would like to know who were the proper people for the purpose. He did not know whether the ordinary public analyst had had sufficient pharmaceutical training to enable him to decide satisfactorily what drugs should be selected for testing. Except for the usual articles—milk, butter, and other common foods—the local authority was often at its wits' end to know what substances to examine. And what was the position with reference to drugs? There were chemicals, such as the iodides and the bromides, but what could they generally find wrong with them? As for galenicals, many of them defied analysis. And, in the past, a prescription at once aroused suspicion in many pharmacies. He believed no local authority would be efficiently doing its duty under these Acts unless Insurance Act prescriptions were taken into the pharmacist's shop on the proper slips. He did not know whether that was being done at present, or what arrangements would be made for payment if they did, but it must be borne in mind that these prescriptions were likely to be used as tests for Food and Drugs Act purposes. It did not seem that prescriptions formed any large proportion of the drugs in Mr. Gilmour's list which were sampled; probably the proportion was not more than 1 in 40. Local authorities would do well to give a little more attention to the accurate dispensing of prescriptions; if they did so, questions of warranty would not arise. In answer to the question asked by Mr. Pollard, he had not heard of a public analyst fixing arbitrarily any general standard of limitation of error, nor could he understand a public analyst who knew his job doing anything of the kind. Supposing the local authorities did have a man with an intimate knowledge of pharmacy to advise them, if he were merely on the look-out for a row of scalps, he could get them without much difficulty. He was interested to hear from Mr. Hill that the wholesale chemist wanted more definiteness in

standards to which he could conform; but there was a danger in that connexion. The Board of Agriculture had tried to fix a sort of standard for milk, but the effort had not been a success. The standard must not be fixed so high as to shut things out unduly, and the result was that people concerned worked down to the bare minimum of quality which they were allowed to sell. The same might apply to some drugs. Then the question of loss by volatilization presented many difficulties. In the case of formalin tablets—a subject he had looked into—if the Pharmacopœia said there must be so much formalin in the tablets, he would ask how much loss of formaldehyde should be permitted? He was not sure that 50 per cent. of loss was necessary if the tablets were well made. He agreed that the police court was not the place to which to take an erring pharmacist for some offence unwittingly committed, and no one recognized that better than did the officers of local authorities; they regarded the chemist as a man in a class by himself, apart from the ordinary shopkeeper. The Acts undoubtedly required to be amended in several respects.

The President reminded the meeting of the existence of a Joint Committee of the Pharmaceutical Society and of the Society of Public Analysts to which matters of difficulty arising under the Acts could be referred, and it had been the practice of certain analysts to make use of that Committee. There had been in the last three or four years several cases in which the Committee decided that the prosecution would be vexatious, and prosecutions had not taken place. He believed that Committee was instituted through the agency of Sir Thomas Stevenson and Mr. Michael Carteighe.

Mr. D. Lloyd Howard said there was great difficulty attaching to the administration of the Food and Drugs Acts because an offence against the Acts was a criminal offence, and must be punished as such. A man who sold iodoform which was 50 per cent. precipitated sulphur, or santonin which was 90 per cent. boracic acid, was justly liable to be punished as a criminal. That was not common in this country, but it was in India, where they greatly needed a proper Food and Drugs Act. The magistrates were men of high ideals who took their work seriously and were anxious to do their duty, but there was not the requisite scientific knowledge or a proper understanding of the public analyst's certificate. When one discussed the question of a few parts of a substance in a million, very few people formed an

adequate conception of the meaning. One part per million was practically the same as one inch in 16 miles; also one ton was one million grammes. That consideration brought one to the difficulty of a standard under the Sale of Food and Drugs Acts. The Pharmacopœia standard should be as high a standard as could be obtained, but it was another matter to call a man a criminal because he did not attain to that high standard. The Local Government Board had fixed the limit of lead in tartaric acid as 20 parts per million. He believed it was possible to produce tartaric acid with only half that lead content, but the limit was founded on the knowledge that lead was a noxious product, and this the Bench knew, and they were likely to be very severe on a man who sold the substance with 40 parts of lead per million, yet that only meant 1 grain in 3½ lb. of the acid, so that a medicinal dose of lead was only likely to be taken in six months' consumption. Just as magistrates depended for their knowledge of law on the law expert, the magistrate's clerk, so for their technical cases they should have a scientific expert on the subject concerned, who should act rather as "assessor" than as advocate.

Mr. Herbert Knott said that up to now the inspectors under the Food and Drugs Acts had been acting on behalf of the public, protecting them against short weights and inferior quality; but under the Insurance Act the aspect of affairs was likely to be very different; it would be a public body looking after its own interests; it would stand in the positions of purchaser, analyst and prosecutor. He had thought it possible there might be created a staff of Government inspectors of pharmacies; and then it might be possible to hear cases of contravention of the Act in the room of a Government department instead of an open Court, unless it were of sufficient importance to be carried to the police court.

Mr. H. Antcliffe thought it would be best that the public analyst should have tenure of office, for it was possible for a member of the Local Council who happened to be a pharmacist to be vindictive if the analyst made a report against him. The managing director or board of directors or manager of a private firm should be held liable, as well as the pharmacist, for goods supplied to hospitals, and if the case were a bad one the prosecution should be a criminal one.

Mr. W. F. Wells said he had made inquiries in Dublin and Belfast, and he knew by personal experience some of the difficulties which local authorities had to contend with. In the first quarter of the present year in Dublin there were 90 drugs purchased, only

three of which were condemned. In Belfast the result was much the same. He objected to some of the remarks which had been made in the discussion about local authorities; he had seen efforts made to protect a friend, whose sample was condemned by a member of the local authority, but without success. If a man were prosecuted for selling defective milk he answered that he had a warranty from the man in the country who supplied it. The magistrate accepted the warranty and dismissed the case, and the costs were heavy against the local authority. It was not always easy to get at the man who supplied the warranty. In the case of olive oil, for instance, he might be in England while the retailer was in Ireland. There should be standards, but there should also be fair play all round. He knew of a case in which the subject was linseed meal, which was proved to be not what it ought to be. The case was dismissed because it was bought at a grocer's, the magistrate remarking that one would not expect to get the best article at the grocer's. He believed that in Ireland the Act was fairly administered by the inspectors, who, however, did not quibble at small things, such as selling dilute mercurial ointment when asked for a pennyworth of mercury ointment. He agreed there was good reason why the Acts should be amended, but it would be beneficial if some authority were to decide what drugs should be examined. Throughout the rest of Ireland the Acts were supposed to be carried out by police sergeants, whom he did not consider proper persons for the work. The discussion must prove of very great use, and he hoped to see public institutions, doctors' surgeries, and all places where drugs are used or sold, brought under the same control as were pharmacies, because he suspected some of those places to be sources for the distribution of impure drugs.

Mr. R. A. Cripps said one of the difficulties referred to in the discussion was that connected with sampling. This might be much more efficiently done if the practice of taking unofficial samples were extended. It had sometimes been found that the first time a person went to a shop he was supplied with the genuine article, and it was only when he became known as a customer that, if at all, he was served with the adulterated substance. Therefore the deputy should buy the sample, and the principal should enter only at the last moment, when the purchase had been made. That would result in the honest man being left in peace, while the fraudulent man would be prosecuted. One great difficulty in connection with the administration

of the Acts was the great ignorance of magistrates. He knew the case of a man who had been selling lime juice cordial for lime juice for ten years, and was let off because he said he did not know the difference, though "cordial" was only half the market value of the lime juice.

The question of deterioration of drugs by keeping would also be dealt with by the system of taking unofficial samples; because, for instance, in the case of spirit of nitre, a sample having been found deteriorated, the chemist would be warned, so that he could keep it in future under the best conditions possible. The careless pharmacist should be punished, in his opinion, almost as severely as the fraudulent one. He had not heard of any such agreement as to margin of error as Mr. Pollard suggested: he would judge each mixture submitted on its merits, and make certain allowances as dictated by his knowledge of the drugs concerned. But there would be a difficulty in the case of an analyst who had not had experience behind the counter.

Mr. H. Finnemore said he did not think it was any exoneration of a pharmacist to say that his dispensing was done while the public inspector waited. He could always say to the inspector that he must wait, and if the inspector were kept waiting an hour or two it would induce him to come at a more convenient time. He would not like to think that the Conference would exonerate any carelessness of the kind mentioned. Of course they did not know what happened in Mr. Pollard's case. As regards the point raised by Mr. Kemp, where an inspector was incorrectly informed that paregoric was not sold, it seemed advisable to suggest that an alteration of the Acts should be made which would give power to authorities to search and take possession of any drugs of a doubtful character.

Mr. E. F. Harrison said it seemed to him that one general consideration emerged from the whole discussion—namely, that the pharmacist ought to take a larger part than that of a mere seller; he ought to take part in the administration of all laws concerned with drugs. The Pharmacopœia was not a standard under the Food and Drugs Acts, but it was, of course, a *primâ facie* standard in the absence of any other; speaking for himself, he had very little doubt that it would in time be the recognized legal standard. He thought Mr. Hill hit the nail on the head when he said that what was wanted by manufacturers was more definiteness in the requirements of the B.P. Personally he thought that was equally wanted from the point of view of the analyst, for

the public analyst was less qualified than the manufacturer for knowing what was required. One remedy for that was that pharmacists should, as far as possible, become public analysts. It was, of course, too late to regret that there was another body than the Pharmaceutical Society giving qualifications to public analysts, and the Institute of Chemistry was the recognized body to impose test for analysts. However, there was no reason why a percentage of pharmacists should not study further and qualify themselves as analysts, as, in fact, a good many did. He thought it was quite a common experience at Bloomsbury Square for the best one or two men to work on further and take the Institute qualifications, and there were actually a considerable number of pharmacists who were qualified to take the position of public analyst, and a certain number holding such positions. He thought they would agree that it was an advantage that pharmacists should so qualify because their whole training rendered them more efficient and more qualified to act in the matter of drugs. As regards the retail pharmacist, he would not for a moment wish to say that his responsibility should be diminished, but he thought the retail pharmacist could not in these days manufacture more than a few of his preparations, and had to depend to a great extent on the large manufacturer, for he could neither work on large enough quantities nor spend the time in the thorough and exhaustive tests which manufacturing houses imposed. As to the actual administration of the Acts he thought pharmacists ought to take a very much larger part in it than they did. It seemed to him that the difficulty could be mitigated, if not entirely removed, by the administration being put more into the hands of pharmacists; in fact, he would like to point out that they had with them in the flesh a very important reminder of the enormous advantage of having a pharmacist in the legislative body. He, therefore, thought they had the remedy to some extent in their own hands in steadily pushing in the direction of pharmacists coming more to the front in all matters concerning drugs and the preparation of drugs.

Ald. A. S. Campkin, J.P., said his object in rising was to refer to the system of obtaining unofficial samples, to which reference had been made, and as one who had taken part in the administration of the Acts for a good many years he believed that more unofficial samples were taken than was generally known. Experience of one district did not necessarily represent that of another, but many such were undoubtedly obtained and it was

fair to assume that when no subsequent action was taken it was for the reason that they were found of a sufficient standard. Undoubtedly after so many years' experience there were apparent reasons for the amendment of the Acts, adopted in the first instance for the simplification of procedure and in the interest of the public. The cost of any proceedings under the old system made it almost prohibitive for an individual, hence the duty was relegated to a local authority and adjudicated upon by a Bench of Magistrates, the least costly of courts. From his own experience of some 20 years as a magistrate he did not remember a conviction with regard to drugs, but with milk and articles of food, the former especially, prosecutions were more frequent.

In many instances in various parts of the country where convictions had been secured it had often happened that those supplying were not connected with pharmacy.

Reply by Mr. H. Wippell Gadd

Mr. H. Wippell Gadd said a point mentioned by one of the speakers was the bacteriological examination of samples. It seemed to him that bacteriology was a science somewhat in its infancy, and he would not like to trust any bacteriologist to say *ex cathedrâ* what was adulteration in a bacteriological sense. With regard to a board of reference, Mr. Robinson had suggested that a single individual might do instead of a competent board. Personally he knew that the County of Middlesex had appointed a singularly capable officer, but he also knew that they had instituted at least one case which, as far as he could understand, was designed to advertise a book but which only succeeded in advertising a proprietary article. If they would do him the honour to read his paper in its entirety he thought they would agree with him that no unofficial committee could have the authority that a board of reference properly constituted would have. As Mr. Harrison had asked for a definite conclusion to the afternoon's proceedings, he would like to suggest that they should concentrate their efforts on getting a board of reference set up, for it was imperatively needed. One speaker had asked whether one could add ethyl nitrite to sweet spirit of nitre which was weak in that respect. He was not in the habit of giving gratuitous information concerning hypothetical eventualities, but at the same time if he were an honest man and selling something that he honestly believed to be correct but which he knew could be

condemned on a technicality, he should spare no efforts to dodge any public official who was trying to entrap him.

Reply by Mr. C. A. Hill

Mr. C. A. Hill said Mr. Gilmour had referred to unofficial standards, and the reason he had not gone into the matter was because he thought the value of these unofficial standards was sufficiently well understood. They were of the greatest possible value to manufacturers and of extremely limited value to public analysts. There had already been prosecutions for the sale of compound decoction of aloes made up of either improperly prepared or improperly diluted concentrated preparations, and he thought the relation of such demand for concentrated galenicals to the subject under discussion invited somewhat careful consideration. Mr. Robinson had referred to his (the speaker's) remarks on definite standards, but he was referring not so much to milk as to the limits of impurities in chemicals, which could well be defined. Mr. Howard's views coincided entirely with his. There were two points which he hoped would be brought out in the discussion; one was the question of the duration of a warranty, which seemed to him to be a very important point and one with which he did not feel competent to deal, and the other the possibility of having an Act relating to the sale of drugs quite separate from the sale of food.

Reply by Mr. J. P. Gilmour

Mr. J. P. Gilmour said in the course of the discussion they had had the pleasure of listening to Dr. McWalter and Mr. Wells, whom it was always a pleasure to hear. Dr. McWalter made reference to the Insurance Act, expressing the fear that the under-remuneration of pharmacists might lead to the substitution of inferior drugs. Personally, he thought there was double protection against that, the first of which was that the Food and Drugs Acts was applicable to Insurance prescriptions, and the other was that there was an express agreement that the contract-party should supply goods of good quality. It did not seem to him that that was a very legal definition, but there were adequate safeguards against inferior quality or substitution. Then as to prescriptions, when they were explaining to the Commissioners all the operations which were included in the act of dispensing they had to point out that it was necessary to make up mixtures in a graduated stamped measure—that was very fully explained—

and under those circumstances, unless solutions had been carelessly made up, there was exceedingly little risk of there being any serious discrepancy. If cheap bottles were used—they knew well enough that an 8-oz. bottle might sometimes only contain 7 oz.—they ought to take the greatest care in the dispensing of prescriptions. As to the question of expenses, Mr. Kemp rather put in that the local prosecutor would be entitled to them in the event of there being moral certainty that a person was guilty. That seemed to him (the speaker) to be a somewhat new principle in English law, a subject with which, he would confess, he was not very familiar, it being needlessly complicated and corrupted through its Norman-French sources, but he would be surprised to hear that it was a principle in English law that a person could be convicted or penalized on a moral certainty. He should be sorry to think it was so. Mr. Robinson asked a question as to the number of prescriptions. They were very few indeed. Then there was a question as to the limits of arsenic and lead. He thought it a hardship that those limits should be placed so high, and he surmised those who originally devised those limits were thinking more particularly of the quantity of beer which could be consumed by the average person than of the quantity of drugs which, comparatively considered, was infinitesimal. With reference to informal samples, there was a table in last week's *Pharmaceutical Journal* (*P. J.*, iv, 37, 75), not a very instructive one from their point of view, and he noticed in that table, with the exception of Birmingham and Wandsworth, the number of samples taken officially was exceedingly small, but he agreed that it would be a great advantage if a larger number of samples were taken informally, and he thought a proper authority should be constituted on the lines indicated in Mr. Gadd's paper.

Reply by Mr. Edward Hinks

Mr. Edward Hinks said that a large number of points had been raised but he would refer to only a few. The Joint Committee that the President had referred to was a private one, and though most useful in certain circumstances, it could not, from its nature, do the work that should be done by the Committee of Reference that had been advocated: it could give advice to analysts, but it could not be publicly quoted.

Many points had been raised with regard to administration: the position of the analyst in this connexion varied widely in

different places. Statutorily he had nothing to do with the taking of samples, but he did advise his authority when necessary as to articles it is advisable to sample, and to that extent directed sampling. In his (the speaker's) opinion the more closely the analyst was connected with administration the better. He would like to protest against the charges of "scandalous mistakes" in administration that had been made. There had, no doubt, been mistakes: it would be strange if, in the course of years, there had not been proceedings, which at any rate from one point of view appeared to be mistakes. A particular case referred to, mercury ointment, he thought must be the prosecution instituted in Yorkshire. That case had gone to the Court of Appeal, and it seemed to him that the judgment there entirely supported the action of the authorities.

It had been stated during the discussion that even when a case had been dismissed the defendant had still to pay the costs. That was by no means always the case. Sometimes, rightly, it was so, but he could assure them that costs were often given against the authority.

Mr. Harrison had held that the public analyst should be a pharmacist. He (the speaker) was quite ready to allow that a public analyst was the better if he were also a pharmacist, as he was also the better for knowledge concerning any of the articles with which he had to deal. But it was a claim that might with equal justice be urged with regard to any of the businesses whose products he analysed. In giving evidence in a cocoa case, for instance, the analyst would be the better if he were also a cocoa-grinder. It seemed often to be expected of the analyst that he should be a dairy-farmer. The essential qualification of the Public Analyst was that he should be an analyst. A pharmacist might be a capable analyst but he might not be, and it appeared to him that his training had not been that of an analyst. It would be a far more difficult thing for the pharmacist to gain the analytical experience than it is for the analyst to have such knowledge of pharmacy as is required for the proper discharge of his duties.

Many complaints had been made as to the Courts in which cases under the Acts were heard. He thought that this was a matter of which too much had been made. He had been in many of these Courts and found that pharmacists were in good company. The breaker of a motor speed limit was summoned to the same court. What the public thought of was what a man was there for, not under what law he was brought there, whether

it was civil or criminal, or whatever it was. The question of error in dispensing had already been answered by Mr. Cripps and Mr. Finnemore.

Remarks by the Chairman

The Chairman said that he esteemed it a very great honour indeed to have been asked to preside. He thought that the Practice Section was particularly well favoured in that this year the Presidential Address had been so largely taken up with what had had a very great bearing indeed upon the discussion that afternoon. For some years now the State had taken over the attempt to control the purity of food and drugs in this country, and, like a great many other things the State does, it is done in a slip-shod and unsatisfactory manner. He was not saying that it was possible at the outset for them to have devised a great machine which was perfect. No doubt the country was all the better for the administration which had taken place ; but no one, from any point of view, from the point of view of the administrator or the point of view of a possible defendant, or the point of view of the general public, could be satisfied with the existing state of the law. The main provision of the Food and Drugs Acts is to provide that any one who goes into a shop and asks for a food or a drug shall get an article of the nature, substance and quality demanded. Quite a nice, easy thing to put into an Act of Parliament, but they never worried themselves as to who was to decide what was the nature or substance or quality of the article that the customer demanded. He had come across a public analyst who took quite a peculiar view as to what was the nature, substance and quality of the article demanded. He supposed it was inevitable that scientific attainments might lead to overlooking entirely the common-sense point of view. It was his (the speaker's) business on one occasion to defend a case where a chemist was asked by a purchaser for carbonate of soda, and he had the infamy to supply bicarbonate of soda. The chemist was prosecuted, and it came to this—that the analyst in court practically said : "Well, if the purchaser wanted bicarbonate of soda, he ought to have asked for it." Then he had to say to the court that it was the purchaser who ought to be punished. It was all very well for public analysts and scientific gentlemen to take to themselves the right of saying what the person ought to have wanted ! The purpose of the Acts is to see that what the purchasers want they get. The present position of standards is

in a most unsatisfactory state, but so long as it is necessary to legislate for dishonest people and a standard has to be set up, a certain amount of harm is sure to be done. It is not possible to set up a standard which is not what is called a reasonable standard, and there is a tendency to reduce the average quality of the article sold when a definite standard is fixed, competition being such that the manufacturer or the producer says if that is the article which satisfies the law I cannot afford to give a better. This is inevitable. The Pharmacopœia has been laid hold of by the Court as a ready sort of makeshift in the matter of a standard. It is not by statute a legal standard, but heaven help the defendant who has sold something by the Pharmacopœia name if it is not up to that standard, because the position in law is that he must prove a different standard—if he can. It will not be easy, and it will not be inexpensive. It is not wise that the question as to what the public mean when they ask for a certain substance should be settled at the expense of one particular authority, much less at the expense of one particular trader or any class of traders. That is a matter that ought to be settled by the State through a proper board of reference. The character of the Courts is important from two points of view. The Legislature has gone on legislating for matters of daily life, and they have not troubled to set up proper courts. They have simply used the old Petty Sessions, and although a magistrate may be the best possible person to decide whether or not a person was drunk the night before and what is to be the fine, yet he is not necessarily the best judge to decide between conflicting analysts as to the purity of cod-liver oil. The court itself is not a fit tribunal in many cases. It is not fair if the offence is a technical one to have to stand in the same place and be treated in the same manner as a person who has committed an offence of which he ought to be ashamed. There is a great deal of unnecessary ignominy about it. As to the warranty question. One of the main difficulties of the law in suppressing adulteration is that it makes all offences quasi-criminal, in fact to all intents and purposes a criminal offence. If a man is to be treated as a criminal it is necessary to provide a way out for him to say that he was not guilty of any real blame in the matter; but if the offence was a civil offence, if it was regarded as not necessarily involving fraud or even at times gross carelessness, but the failure on the part of a man who undertakes to supply an article to supply it should be treated as such, and punished for what it is worth. The warranty

defence ought then to be abolished altogether. Pharmacists now are at a most critical stage and the eyes of the public are being turned on them in a way that they have not been before, and whilst on the one hand privileges superior to the ordinary retailer of an ordinary commodity are claimed, on the other hand it is said, "We will be like him; we will take no responsibility, but we will thrust it on to some wholesaler or some manufacturer." The two things are inconsistent. Whilst the law regards the failure to supply an article of the substance and quality specified as a more or less criminal offence, it is possible a warranty defence will be required. There should be such a change in the administration of the law as will make it right and just that the pharmacist who purports to sell an article and does not do so must take the responsibility for it and meet with a suitable punishment, whatever that may be. A remark has been made with reference to special Insurance dispensing. There should be no such thing as special Insurance dispensing; it is dispensing, and it will be the fault of pharmacists if regarding it otherwise they lose the position they have gained. Mr. Robinson suggested that in some way or another Insurance dispensing should be tested like all other dispensing. That should be done by every public authority. It is not true that it is the Government or the public authority that is to be the purchaser and the judge; it is the Insurance Committees that are in fact the purchasers, and there is no reason why the Insurance Committee and the people they represent should not be protected under the Food and Drugs Acts. In conclusion the Chairman said that he would like to be allowed to express their indebtedness to the four readers of the papers and to say to them that he felt sure that the outcome of their papers and the discussion would be to the benefit of pharmacy and the public at large.

THE CLOSING SESSION

On Wednesday afternoon at 2.30 p.m. the members of the Conference again assembled in the Throne Room. Before the business of the afternoon commenced Dr. J. F. Suyver, Secretary of the Pharmaceutial Society of the Netherlands, thanked the members of the Conference for the very cordial reception extended to the foreign delegates. He said it was not the first occasion on which Dutchmen had had the privilege of attending the meetings of the Conference and he hoped it would not be the last; he had enjoyed his visit to London, and on behalf of his fellow-countrymen he wished to thank the Conference for the splendid reception.

Presentation to Mr. E. Saville Peck

The President said a very pleasant duty devolved upon him, and that was to make a presentation to one who was known to all of them, and he thought he could safely say to one who was beloved by all—Mr. Peck. Mr. Peck had served the Conference as one of its Honorary Secretaries for eleven years, and during the whole of that time he showed himself not only a man of very great ability in connexion with the scientific work of the Conference, but also a very diplomatic and tactful man. In Mr. Peck they had had an ideal Secretary, who had done everything he possibly could to further the work of the Conference, and now on his retirement they wanted to make him a little presentation to show their affection for him. They were going to keep him amongst them, he would still remain as one of the officers, and before long he hoped to see him as President.

The President, in the name of the Conference, then presented Mr. Peck with a gold watch, together with a diamond ring for Mrs. Peck.

Mr. E. Saville Peck on mounting the platform was loudly and continuously cheered. He said words were entirely inadequate to express the feelings that he had in his heart at that moment. He wished he had the silvery tongue of an Atkins or the ever-ready wit of an Edmund White, or the rare and refreshing ripple of a Woolcock. He would like to take the opportunity of thanking the Conference very heartily for allowing him to have the unique opportunity of experiencing the friendship of some of the foremost men in pharmacy at the present time. They only needed to look at the names of those who had been President during his tenure of

office to realize the force of what he wished to imply. He had always maintained that in the choice of a President they ought to consult with the local associations who were inviting them to their district, and he felt sure that that co-operation had been useful in many ways. They owed a great debt of gratitude to the Honorary Local Secretaries, and they realized that those men had thrown their whole souls into the work, and it was very largely due to the social success of the gatherings that they were able to bring together such a large number of members to discuss the scientific papers. Of course, he had been most intimately associated with his colleagues on the secretariat, and he particularly wished to thank him under whom he served his novitiate—he referred to ex-President Francis Ransom. Following him, he had the great privilege of working with the present President of the Pharmaceutical Society, Mr. Edmund White. Then there was his friend Horace Finnemore. They all knew that he was a man with a wide knowledge of pharmacy and of sound common sense, of sterling honesty of purpose and enthusiasm, which he trusted would carry him and the Conference many stages beyond the position which it had attained. He also wished to tender his thanks to the Pharmaceutical Press, and more especially to Mr. John Humphrey for the reprints of the papers. In doing so he felt sure he was voicing the opinion of all those who had taken part in the discussions when he said that those reprints of the papers were of immense help in every possible way. Lastly, he came to the general body of members, and he felt he had to thank them very heartily for all the kindness and consideration they had shown him while he had been Secretary, and more especially for the charming gifts they had presented to his wife and himself. He felt it was only right that his wife should share the benefit of some of the compliments that had been showered upon him, and he was quite sure he was only expressing her thoughts when he said she was deeply grateful not only for the beautiful ring, but also for the good times they had both enjoyed on many occasions as members of the Conference. Looking at that large audience, he felt, notwithstanding the many changes through which pharmacy had passed, the Conference had gone on on very much the same lines on which it was started by the old worthies of fifty years ago. They set in motion a big flywheel, which had been running steadily ever since, and which, with a little readjustment from time to time, he trusted might long continue to serve pharmacists not only in this country,

but in the overseas dominions and in Ireland. In conclusion, he again thanked the members for the very kind expressions of their goodwill, which he and Mrs. Peck would prize so long as they lived.

Election of Officers

On the motion of Mr. Thos. Tyrer, seconded by Sir William Baxter, the following officers were elected for 1913-1914 :—

President, E. H. Farr ; Vice-Presidents, Sir William Baxter, J.P., J. P. Gilmour, E. F. Harrison, B.Sc., F.I.C., E. Saville Peck, M.A., W. F. J. Shepheard, Edmund White, B.Sc., F.I.C. ; Hon. Treasurer, D. Lloyd Howard ; Hon. General Secretaries, Horace Finnemore, B.Sc., F.I.C., Reginald R. Bennett, B.Sc., F.I.C. ; Hon. Local Secretary, R. Cecil Owen ; other members of the Executive, T. O. Barlow, F. W. Branson, F.I.C., F. W. Gamble, C. H. Hampshire, B.Sc., A.I.C., C. A. Hill, B.Sc., F.I.C., T. Stephenson, J. A. Thomas, G. Whitfield, H. Wilson, F.I.C. ; Auditors, I. Bourdas, W. F. Gulliver.

Mr. E. H. Farr thanked the members very much for the great honour they had done him in electing him to the distinguished office of President. He could not hope to rival some of the able Presidents who had preceded him, but he could assure them he would do his best. He understood they were to receive an invitation to meet at Chester next year, and he hoped to have the pleasure of seeing a large number of those present, then he felt sure they would have a most enjoyable Conference.

Invitation to Chester

Mr. W. F. J. Shepheard said he rose with very great pleasure, as representing the Chester pharmacists, to extend an invitation to the Conference to meet at Chester next year. He could assure them the Chester pharmacists would welcome them most heartily, and everything that could be done to make the meeting of 1914 a complete success would be done. The Chester pharmacists were unanimous in supporting the invitation. Although they could not undertake to supply the lavish hospitality or find the palatial buildings which the Conference had had the use of at its meetings in London, at any rate he thought they could find material which would create interest and enjoyment to those who would honour Chester with their attendance.

Mr. Harold Wyatt supported the invitation to Chester. He

was a Liverpool man, and Liverpool people looked upon Chester as their playground. As a centre for excursions it was hard to beat.

Mr. W. F. Wells proposed the acceptance of the invitation. Mr. J. P. Gilmour seconded. The motion was put to the meeting and unanimously adopted.

Votes of Thanks

Mr. T. Stephenson proposed a vote of thanks to the Local Committee and the Ladies' Committee. He said he had experience of local committees, and after watching the working of the Stewards during the last few days, he congratulated Mr. White and Mr. Woolcock on having such an efficient body of Stewards. With regard to the Ladies' Committee they had all seen the work they had done, and they knew that when a woman undertook a thing she did it with a thoroughness that no mere man could ever imitate.

Mr. T. O. Barlow seconded the motion, and it was carried with acclamation.

Mr. Edmund White acknowledged the vote in a humorous vein. He commended the members of the Local Committee for their hard work and obedience to instructions.

Mr. W. J. U. Woolcock replied for the ladies.

Dr. C. Symes proposed a vote of thanks to the Pharmaceutical Society and its officers for the help given to the Conference, and to the Editor of *The Pharmaceutical Journal* for supplying reprints of papers contributed to the Science Section and Practice Section.

Mr. T. Maltby Clague seconded the vote.

Mr. W. G. Cross and Mr. P. F. Rowsell replied.

Mr. R. Wright proposed a vote of thanks to the President for the very able and courteous manner in which he had presided over their proceedings.

Mr. E. M. Holmes seconded the proposition, which was carried with acclamation.

The President briefly replied.

THE SOCIAL GATHERINGS

Reception at the Guildhall

On Monday evening at the Guildhall Mr. Edmund White (Chairman of the Local Committee) and Mrs. White, Mr. J. C.

UMNEY (President of the Conference) and MRS. UMNEY received members of the Conference and their friends and a number of distinguished guests. At 9 p.m. the Right Honourable SIR DAVID BURNETT, Lord Mayor of the City of London, and the Lady Mayoress were announced. His Lordship addressed the assembly and expressed great pleasure in welcoming the Conference to the Guildhall, adding that the importance of the work of the Conference could not be overstated. He spoke of the objects of the Conference as formulated in its constitution, and said that it had been of considerable benefit both to the retail and wholesale sections of the drug trade by its encouragement of friendly relations, while by the establishment of a research fund and in other ways it had enabled the members to keep astride with the progress of the science of medicine. Considering all that the Conference had done since its establishment in 1863, the Corporation of the City of London esteemed it as a great honour that the reception should be held in the Guildhall on the occasion of the Jubilee. His Lordship then referred to the number of distinguished men of science who had been connected with the Conference and he commended the principle of purity of medicines, which is one of the Conference objects, remarking that this had been truthfully and faithfully carried out by the Conference. In concluding, he repeated his warm welcome to the members and delegates and expressed the hope that the Conference would long continue its useful work for the benefit of the members and for the public good.

THE PRESIDENT thanked his Lordship for his kind words, and said that every one present felt that it was a great privilege to meet in the Guildhall.

During the evening an orchestra played in the Great Hall and a concert was given in the Art Gallery. Refreshments were served in the Crypt.

BANQUET IN THE HOLBORN RESTAURANT

On Tuesday evening dinner was served to nearly 450 members of the Conference and their friends in the King's Hall, Holborn Restaurant. After coffee had been served the loyal toast was proposed by the President and the proceedings then assumed an informal character. No speeches were permitted. There was a choice selection of instrumental music during the dinner and a very pleasing musical entertainment afterwards.

Garden Party

On Wednesday afternoon a garden party was held in the gardens of the Royal Botanical Society in Regent's Park. The visitors were received by the President and Mrs. Umney. Tea was served in a pavilion on the lawn. The Conference photograph was taken during the afternoon.

Smoking Concert

On Wednesday evening a Smoking Concert was held in the King's Hall, Holborn Restaurant. Sir Edward Evans presided. An excellent programme had been arranged by Mr. F. W. Crossley-Holland, all the items being contributed by Conference members and their friends.

Excursions by the Ladies

On Tuesday morning, after the close of the Presidential Address, the ladies visited the Mansion House and the Church of St. Bartholomew the Great. Mr. E. A. Webb explained the history of the church and of the restorations. On Tuesday afternoon while the meeting of the Practice Section was in progress, the ladies visited Hyde Park, and afterwards were entertained to tea at Selfridge's by Mr. Gordon Selfridge.

Wednesday morning arrangements for the ladies included visits to the Mint and the Houses of Parliament; parties were conducted over the two Senate Chambers by Mr. W. S. Glyn-Jones, M.P., Sir Francis Edwards, M.P., Mr. R. A. Cooper, M.P., Mr. Walter Rae, M.P., and Mr. Harold F. Cawley, M.P.

Excursion to Windsor and Bourne End

On Thursday morning Conference members left Paddington in a special train for Windsor. Upon arrival at Windsor the visitors were divided into two parties, the first party proceeded at once to the Castle, while the second party visited either Eton or Windsor Park, returning to the Castle later. Luncheon was served for both parties at the *White Hart Hotel*, Windsor. Four large steam launches had been chartered to convey both parties up the river from Windsor to Bourne End. Tea was served on board. From the Bourne End landing stage the

visitors were conducted to the railway station, where the special train was in waiting to return the party to Paddington.

Visit to Ealing Golf Club

Members of the Conference were invited to spend Friday on the Ealing Golf Course. About fifty players and friends accepted the invitation. There was a stroke competition in the morning and a bogey competition after lunch.

LIST OF MEMBERS ELECTED SINCE THE ANNUAL MEETING HELD IN JULY 1912.

Date of Election.	Name and Town.	Proposed By
October 2, 1912.	Evans, D. G., London	R. R. Bennett.
	Gilling, C., London	,,
	Morrell, F. G., London	H. Finnemore.
January 9, 1913.	Allen, W. H., London	R. R. Bennett.
	Bodsworth, H., London	,,
	Bowe, J. L., Rugby	,,
	Braithwaite, Miss D., London	J. O. Braithwaite
	Cooper, L., London	T. R. Williams.
	Davidson, A. L., London	R. R. Bennett.
	Glew, F. H., London	H. Finnemore.
	Hewitt, T. L., London	,,
	Hewlett, V. C., London	R. R. Bennett.
	Hipwell, S. J., London	P. A. E. Richards.
	Hora, T. T., London	H. Finnemore.
	Jacks, D. R., London	R. R. Bennett.
	Keall, J., London	W. J. U. Woolcock.
	Maben, T. M., London	R. H. Benson.
	Matthews, J. H., London	Hon. Gen. Secs.
	Morson, L. J., London	R. R. Bennett.
	Phillips, P. B., London	,,
	Ramage, A. J., Weybridge	,,
	Sayers, W. C., London	Hon. Gen. Secs.
	Shewell, A. B., London	R. R. Bennett.
	Smith, J. B., Hitchin	F. Ransom.
	Skinner, H., London	R. R. Bennett.
	Surfleet, A. G., Hull	H. Finnemore.
	Taylor, H. A., London	,,
	Town, G. E., London	,,
	Warrick, R. W., London	R. R. Bennett
April 8, 1913.	Arnfield, T. O., Stockport	,,
	Baker, H. W., London	Hon. Gen. Secs.
	Balcombe, J., Cheltenham	J. A. Thomas.
	Bedell, Miss M. J., Carshalton	R. R. Bennett.
	Bennett, O. E., London	,,
	Beverley, T. L., London	,,
	Bolton, Miss M., Hull	,,
	Britton, A. B., London	,,
	Bruce, Miss E., Leamington	,,
	Bullen, F. E, Princetown	,,
	Cheers, R. A., London	,,
	Claremont, Miss H. E., London	,,
	Crane, J. H., London	,,
	Dunstan, S., Newcastle	,,
	Edwards, J. M., London	Hon. Gen. Secs.
	Eldred, W., South Rhodesia	R. R. Bennett.
	Etheridge, Miss A., Barnsley	,,
	Fouracre, R., London	,,
	France, J. H., London	,,
	Freke, Mrs., London	,,
	Gibson, G. W., London	,,
	Goodall, T. S., London	,,
	Goss, J. O., Reading	,,
	Green, J., London	Hon. Gen. Secs.
	Haigh, A., London	R. R. Bennett.
	Hammond, H. W., London	,,
	Harper, T., Belfast	Hon. Gen. Secs.
	Harvey, H. M., London	R. R. Bennett.
	Hewitt, H. H., London	,,
	Heywood, Miss S. J., London	,,

Date.	Name and Town.	Proposed by.
	Hill, E., Bradford	Hon. Gen. Secs.
	Howell, J., London	R. R. Bennett.
	Jackson, Professor, London	,,
	James, J., London	T. R. Williams.
	Jenkins, A. H., London	R. R. Bennett.
	Jones, E., London	Hon. Gen. Secs.
	Lindley, J. S., London	,,
	Lindsey, R. W., London	R. R. Bennett.
	Malone-Barrett, F., London	T. R. Williams.
	Marshall, H. B. K., London	Hon. Gen. Secs.
	Martin, H., London	R. R. Bennett.
	Masson, H., London	Hon. Gen. Secs.
	Miller, H., Cheltenham	J. A. Thomas.
	Miller, W. E., London	R. R. Bennett.
	Milsom, F. E., London	Edmund White.
	Nelson, W. B., Wealdstone	R. R. Bennett.
	Noble, J., London	,,
	Phillips, H. A., London	,,
	Philp, W. J. I., London	Hon. Gen. Secs.
	Pinchen, W. J., London	,,
	Potter, W., London	,,
	Price, H. H. G., London	,,
	Roberts, W., London	R. R. Bennett.
	Salter, L. E., London	,,
	Saxby, A. C., Cheltenham	J. A. Thomas.
	Shadforth, W., London	Hon. Gen. Secs.
	Small, J., London	R. R. Bennett.
	Smith, B., London	,,
	Somerton, W. K., London	Hon. Gen. Secs.
	Stephens, H. J., London	,,
	Stiles, H. W., Doncaster	R. R. Bennett.
	Stooke, F. A., Sanderstead	,,
	Storey, W. A., London	H. Finnemore.
	Thomas, J. O., London	Hon. Gen. Secs.
	Tocher, G. A., London	R. R. Bennett.
	Watson, A. J., Tynemouth	S. Hill.
	Watson, H. E., London	Hon. Gen. Secs.
	Whales, T., London	,,
	Whatmough, W. A., London	R. R. Bennett.
	White, J. F., Leeds	,,
	Will, Mrs. Watson, London	Hon. Gen. Secs.
	Wilson, J. F., London	,,
	Windmill, W. H., London	R. R. Bennett.
May 31, 1913.	Allen, G. S., Long Melford	E. S. Peck.
	Anderson, D., London	H. Skinner.
	Atkins, E. A., London	J. Keall.
	Aukland, W. K., London	A. Hanson.
	Bailey, A. E., London	H. Skinner.
	Baker, H. J., London	Hon. Gen. Secs.
	Bately, S. B., London	H. Skinner.
	Boehm, F., London	H. Finnemore.
	Bowie, G. D., London	,,
	Brammall, R. T., London	The President.
	Braund, P. F., Winnipeg	E. C. Sayer.
	Carter, J. C., London	H. Skinner.
	Eacott, G., Sittingbourne	,,
	Evans, J. E., London	Hon. Gen. Secs.
	Fairburn, H., Northallerton	The President.
	Flick, W. S., London	,,
	Fox, F. B., London	Hon. Gen. Secs.
	Francis, J. B., Wrexham	,,
	Frost, J. H., London	H. Skinner.
	Gange, G., London	Hon. Gen. Secs.
	Gaze, W. E., London	J. O. Braithwaite.
	Grassick, A., London	H. Skinner.

Date.	Name and Town.	Proposed by.
	Happold, C., London	Hon. Gen. Secs.
	Harvard, H. L., Swansea	,,
	Hearle, J., London	H. Finnemore.
	Holding, J., London	Hon. Gen. Secs.
	Hollick, R., Birmingham	R. R. Bennett.
	Jackson, R. E., Dartford	Hon. Gen. Secs.
	Jones, M. I., London	,,
	Jarvis, Dr. J., Paris	T. E. Lescher.
	Keith, A. R., London	Hon. Gen. Secs.
	Lawrence, H., Kenley	G. Brown.
	Lawson, A. E., London	H. Skinner.
	Lloyd, H., London	,,
	Lownsborough, R. E., London	A. Latreille.
	Matthews, C. W., London	Hon. Gen. Secs.
	Melhuish, A. R., London	A. Latreille.
	Michie, C. C., London	Hon. Gen. Secs.
	Mitchell, H., London	T. R. Williams.
	Norwood, J. P., Wath-on-Dearne	R. R. Bennett.
	Parrott, J., Richmond	,,
	Pearson, G. E., London	Hon. Gen. Secs.
	Pratt, W. R., London	H. Finnemore.
	Sanford, W., London	Hon. Gen. Secs.
	Shacklock, J. H., London	,,
	Shelley, W. H., London	,,
	Shirtcliff, W. E. D., London	H. R. Procter.
	Simmons, W. H., London	Hon. Gen. Secs.
	Upfill, W. T., London	,,
	Wellington, Mrs., Uppingham	,,
	Wride, F. B., Southampton	,,
July 3, 1913.	Allen, E. W., London	H. Finnemore.
	Blyton, J. H., Manchester	A. J. Pidd.
	Bonner, C. G., London	T. R. Williams
	Brooks, C., London	W. J. U. Woolcock
	Bartlett, Miss D. J., London	R. R. Bennett.
	Chater, A. J., London	W. J. U. Woolcock.
	Demuth, H., London	R. R. Bennett.
	Fielding, M. A., Cork	Hon. Gen. Secs.
	Finnemore, Mrs., London	H. Finnemore.
	Francis, R. P., Melbourne	W. J. U. Woolcock.
	Goodall, F. C., London	R. R. Bennett.
	Harvey, F., Surbiton	Hon. Gen. Secs.
	Heselton, C. J., Newcastle-on-Tyne	,,
	Hocking, F. A., London	,,
	Hoffmann, C. M., London	H. Finnemore.
	Jones, A., London	W. J. U. Woolcock.
	Judd, W., London	R. R. Bennett.
	King, Miss K. M., Liverpool	H. Finnemore.
	Layman, E. B., London	The President.
	Lloyd, I. T., Chelsea	W. J. U. Woolcock.
	Loxley, F. L. K., Oxford	R. R. Bennett.
	McKenzie, J. M., Edinburgh	J. R. Hill.
	Mills, H. A., London	H. Finnemore.
	Milner, J., Greenwich	Hon. Gen. Secs.
	Mundell, S. R., Leeds	J. H. Beacock
	Parsons, Miss D. M., Sevenoaks	R. R. Bennett.
	Poole, J., Birmingham	W. J. U. Woolcock.
	Reekie, B., Hamilton	Hon. Gen. Secs.
	Renouf, Miss N., London	R. R. Bennett.
	Rivers-Willson, A., Oxford	H. Finnemore.
	Robinson, R. A., Jun., London	W. J. U. Woolcock.
	Sinha, B. C., Calcutta	D. Hooper.
	Smith, F., Birmingham	W. J. U. Woolcock
	Smith, T. J., London	R. R. Bennett
	Wadsworth, A., Sydney	H. Finnemore.
	Wardle, Miss E., London	R. R. Bennett.

Date.	Name and Town.	Proposed by.
	Wing, A., Woolwich	A. Goldthorpe.
July 21, 1913.	Baker, T., Oldham	J. Grier.
	Carr, F. H., Sidcup	H. Finnemore.
	Cornwell, T. C., Hanley	T. Bentley.
	Crawshaw, E., London	Hon. Gen. Secs.
	Dalmas, W. E. de St., Leicester	A. F. Cholerton.
	Milling, J., Chester	W. F. J. Shepheard
	Sanger, E., London	C. S. Presant.
	Saunders, S. T., London	Hon. Gen. Secs.
	Simon, J., Chester	W. F. J. Shepheard
	Smith, J., W. Norwood	Hon. Gen. Secs.
	Smithson, J., Brighton	,,
	Swaffin, J. P., Brixham	W. B. Nelson.
	Thompson, J. A., London	G. A. Tocher.
	Whitfield, G., Scarborough	H. Finnemore.
	Williamson, H. S., North Shields	Hon. Gen. Secs.

HONORARY MEMBERS

Baker, R. T., F.L.S., Technological Museum, Harris Street, Sydney, N.S.W.
Bourquelot, Prof. Em., Journal de Pharmacie et de Chimie, Paris.

Fourneau, Mons., Chef de Service à l'Institut Pasteur, 25, Rue Dutot, Paris.

Gorcum, W. C. van, 74, Witte de Withstratt, Rotterdam.

Haajen, V., Avenue Isabelle 15, Antwerp.
Hérissey, H., Ecole Supérieure de Pharmacie de Paris.
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Itallie, Prof. L. van, The University, Leiden.

Kiliani, H., Der Universität Freiburg i. B.
Kusnick, Olivier, 22, Rue de Louvain, Brussels.

Lyons, A. B., 102, Alger Avenue, Detroit, Michigan.

Maiden, Joseph Henry, F.L.S., Director of Botanic Garden and Government Botanist, Sydney, N.S.W.
Mello, J. C. de, Address not communicated.

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Petit, A., Rue Favart, 8, Paris.
Prain, Sir David, Lieut.-Colonel, I.M.S., M.A., M.B., LL.D. (honoris causâ), Director of Royal Botanic Gardens, Kew.

Remington, J. P., Professor of Pharmacy, College of Pharmacy 145, North Tenth Street, Philadelphia, United States.

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Wielen, Prof. P. van der, The University, Amsterdam.
Wiley, H. W., Cosmos Club, Washington, U.S.A.

FOREIGN AND COLONIAL MEMBERS

Anklesaria, J. D. E., F.C.S., The Gujerat Chemical Works Co., Ahmedabad, India.

Backhouse, H. N., 5, Rue de la Paix, Paris.
Barnes, Prof. J. H., B.Sc., F.I.C., F.C.S., Government College of Agriculture, Lyallpur, Punjab, India.
Bowen, Dr. W., The Surgery, Mombasa, British East Africa.

Branch, G. T., P.O. Box 51, Umtalia, Rhodesia.
Braund, P. F., Ivan Court, River Avenue, Winnipeg, Canada.
Brown, T. F., M.R.C.S., L.R.C.P., Ingor Street, Ararat, Victoria, Australia.
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Champion, G. A., "Haraldine," Chelmsford Road, Durban, Natal (Y.B to Maw, Son & Sons).
Chapman, W. H., c/o Lyman & Co., 19, St. Luke Street, Montreal (Year-Book to Horner & Sons, Mitre Square, E.C.).
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Cowley, R. C., College of Pharmacy, Brisbane, Queensland.

Day, H. Bartlett, York, Western Australia.
Dey, Notendra Lall, 4, Beadon Street, Calcutta, India.

Eldred, W., Long Valley, P.O. Umbol, Lomagundi, S. Rhodesia.
Elgie, Simon Kelsey, 47, Gardiner Street, Durban, Natal.
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Francis, R. P., 349, Flinders Lane, Melbourne, Australia.
Fritzsche, Karl, c/o Messrs. Schimmel & Co., Miltitz, near Leipzic, Saxony.
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Garibaldi, J. A., 21, Church Place, Gibraltar.
Garner, W. W., Perth, W.A. (c/o F. H. Faulding & Co., 54, Great Tower St., E.C.).
Gasson, W., Kimberley, South Africa.
Glover, Henry, Mount Gambier, S. Australia.
Gokhale, Dr. K. N., The Indian Pharmacy, Girgaum, Bombay.
Gordon, J. C., 676, Main Street, Winnipeg, Manitoba, Canada,
Grice, Walter T., F.C.S., c/o Smith, Stanistreet & Co., Calcutta.
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Ley, D., East Maitland, New South Wales (Year-Book to Evans Sons Lescher & Webb, Ltd., 60, Bartholomew Close, E.C.).
London, H., Rochester, Victoria.

McGuffie, W. A., 146, Queen Street, Brisbane (Year-Book to Maw, Son & Sons, 11, Aldersgate Street, E.C.).
McJannet, Jas., East London, Cape Colony.
Mager, W. K., Queenstown, Cape Colony.
Meiring, J., Worcester, Cape Colony.
Mewkill, Henry Jas., St. Arnaud, Victoria.

Miller, C. B., Graaf Reinet, Cape Colony (Year-Book to Lennon, Ltd., 54, Queen Elizabeth Street, S.E.).
Moore, C. E., Mile End and Porrensville, S. Australia.

Ogburn, J., Charlton, Victoria.

Pincus, Max, Castlemaine, Victoria.
Pond, J. A., Auckland, N.Z.

Razzack, Syed Abdool, Hyderabad, Deccan, India.
Row, W. Edward, George Street North, Sydney, New South Wales.
Ruttonjee, H., Wallace St., Hornby Road, Bombay, India.
Ryan, F. G., c/o Parke Davis & Co., Detroit, Mich., U.S.A.

Samuel, J. B., Mussoorie, India (Year-Book and Letters care of A. Lawrie & Co., 14, St. Mary Axe, E.C.).
Say, S. V. B., Benalla, Victoria.
Scammell, L. R., Adelaide (c/o F. H. Faulding & Co., 54, Great Tower Street, E.C.).
Schaer, Prof. Ed., M.D., Pharmaceutisches Institut, Universität, Strassburg.
Simmonds, F. W., Toowong, Brisbane, Queensland, Australia.
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Smith, F. A. Upsher, 2002, Inglehan St., St. Paul, Minnesota, U.S.A.
Smith, W. Fraser, c/o W. E. Smith & Co., Mount Road, Madras, India.
Sondhi, Maharaj Krishen, Lawrence Medical Hall, Jullundur City, India
Speechly, E., Kurachi, Scinde, India (Year-Book to Maw, Son & Sons, 11, Aldersgate Street, E.C.).
Squire, F. R., San Remo, Italy.
Stevens, H. F., 140, Worcester Street, Christchurch, N.Z.
Stewart, A. M., 2, Bishop's Street, Penang.

Taylor, H. A., Government Civil Hospital, Hong Kong.
Thomas, H., Croydon, Queensland.
Thomas, H. W., 9, Dalhousie Square, Calcutta.
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Wadsworth, A., Sydney, N.S.W., Australia.
Walker, F. G. C., A.I.C., Municipal Health Dept., Shanghai.
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Wardleworth, Theo. H., F.L.S. c/o National Drug and Chemical Co. of Canada, Montreal.
Watkins, George, 206, Queen Street, Brisbane, Queensland.
Watson, Edwin L., c/o D. Waldie & Co., Konnagar, E.I.R., Calcutta.
Wheeler, F., Grant Street, Alexandra, Victoria.
Wilkinson, R., Dunedin, New Zealand.

HOME MEMBERS

Abraham, Alfred C., F.I.C., F.C.S., 87, Bold Street, Liverpool.
Abraham, T. F., 87, Bold Street, Liverpool.
Aitken, Robt., 67, High Street, Dunbar.
Aitken, R., 73, Princes Street, Edinburgh.
Alcock, F. H., F.I.C., F.C.S., 9, Broad Street Corner, Birmingham.
Alexander, Wm., 57, Low Street, Banff.
Allen, C. B., 20, High Road, Kilburn, N.W.
Allen, Charles T., 14, Honiton Road, Kilburn, N.W.
Allen, Edward R., 7, Cowper Street, Finsbury, E.C.
Allen, E. W., 7, Cowper St., Finsbury, E.C.
Allen, G. Stafford, Long Melford.
Allen, K. C., 7, Cowper Street, Finsbury, E.C.
Allen, W. H., 20, High Road, Kilburn, N.W.
Allman, J. D., 23, Kenilworth Road, Ealing, W.
Anderson, D., 21, Broadway Parade, Crouch End, N.
Anderson, David, 31, Fountainhall Road, Aberdeen.
Anderson, James, 70–74, Commercial Street, Dundee.
Anderson, John, 14, Strathmartine Road, Dundee.
Andrews, Fredk., 34, Leinster Terrace, Lancaster Gate, W.
Antcliffe, Herbert, The Beeches, Barnsley Road, Sheffield.
Appleton, J. T., The Walkley Pharmacy, Sheffield.
Arkle, Wm., 13, Penny Street, Lancaster.
Arnaud, F. W. F., F.I.C., Public Analyst's Office, Maidstone.
Arnfield, H., F.C.S., Peak Lodge, Buxton Road, Stockport.
Arnfield, J. C., 7–9, Lower Hillgate, Stockport.
Arnfield, T. O., 7–9 Lower Hillgate, Stockport.
Arnold, H. R., 16, Coleman Street, E.C.
Arnold, S., 2, King's Road, Southsea.
Arrandale, J. S., 16, Queen's Gate, Bolton.
Arrowsmith, A. R., "Dorchester," Wontner Road, Upper Tooting Park, S.W.
Ashmore, W. Hopkins, M.P.S.I., 21, Dawson Street, Dublin.
Ashton, C. S., 46, Dyke Road, Brighton.
Ashton, F. W., 49, Croftdown Road, Highgate Road, N.W.
Aston, W., 27, Montague Street, Worthing.
Atkins, E. A., 71, East Hill, Wandsworth, S.W.
Atkins, S. R., J.P., The Mount, Elm Grove, Salisbury.
Atkins, W. R., Market Place, Salisbury.
Atkinson, A. Proctor, 143, Farringdon Road, E.C.
Atkinson, J. G., 25, Westow Hill, Upper Norwood, S.E.
Atkinson, Leo, 265, Brockley Road, S.E.
Attenburrow, James, 1, High Street, Melton Mowbray.
Aukland, W. H., 96 Camden Rd., N.W.

Bagshaw, Harold, 37, Yorkshire Street, Oldham.
Bain, John, "Bruntsfield," Bridge of Allan, N.B.
Bailey, A. E., 64 High St., Highgate, N.
Baker, Cyril H., Cosham, Hants.
Baker, H. J., 239, Elgin Avenue, Maida Vale, W.
Baker, T., 35, Cranbrook Street, Oldham.
Balcombe, J., Suffolk Parade, Cheltenham.
Ball, A. W., 179, Queen Victoria Street, E.C.

Ballantyne, W. M., 26, Clyde Street, Edinburgh.
Balmforth, A., 5, Grosvenor Road, Whalley Range, Manchester.
Bannerman, R. I., 4, Canning Street, Edinburgh.
Bannister, W., J.P., "Burvale," Watford, Herts.
Barclay, Sir Thomas, 19, Lower Priory, Birmingham.
Barclay, Thomas, New Charford Mills, Saltley, Birmingham.
Barfoot, J. R. D., 69, West Bars, Chesterfield.
Barford, H. W., 34, Union Street, Ryde, Isle of Wight.
Barlow, Alfred H., Otter Works, Strangeways, Manchester.
Barlow, T. O., 2, Palmerston Road, Southsea.
Barnes, Ivor P., 205, Knightsbridge, S.W.
Bartlett, Miss D. J., A.I.C., 16, Mount Nod Road, Streatham, S.W.
Bascombe, F., F.I.C., 17, St. Saviour's Road, Brixton Hill, S.W.
Basker, J. A., F.C.S., 17, Fore Street, Bridgwater.
Bately S. B., 682, High Road, Tottenham, N.
Bates, F. W., Hygiene House, Brooks's Bar, Manchester.
Bates, W., 50, Oxford Street, Southampton.
Baxter G., 11, Polworth Place, Edinburgh.
Baxter, John, Ballymoney.
Baxter, Sir W. J., J.P., M.C.P.S.I., Church Street, Coleraine.
Bayley, Cornelius, Uppingham.
Bayne, C. P., Falconer, 9, Goldenacre Terrace, Edinburgh
Bayne, Thomas, Blandfield Chemical Works, Wheatfield Road, Edinburgh.
Beacock, J. H., 20, Upperhead Row, Leeds.
Beattie, P. R., 110, Bruntsfield Place, Edinburgh.
Bedell, Miss M. I., Queen Mary's Hospital, Carshalton.
Bell, E. Wightman, F.C.S., County Agricultural Laboratory, Spalding.
Bell, Joseph, 113, London Road, Manchester.
Bell, W. A., The Strand, Southsea
Bell, Wm. J., Arcade, Front Street, Tynemouth.
Bennet, D. S., Cahirciveen, Ireland.
Bennett, C. T., B.Sc., F.I.C., F.C.S., 48, Southwark Street, S.E.
Bennett O. E., Royal Waterloo Hospital, Waterloo Road, S. E.
Bennett, Reginald R., B.Sc., F.I.C., Barrister-at-Law, University College Hospital, W.C.
Bennion, R., 76, St. Alban's Road, Watford.
Benson, Robert H., The Dispensary, Guy's Hospital, S.E.
Bethune, W. J., Queensgate, Inverness.
Beverley, T. L., 1, Ulysses Road, West Hampstead.
Billington, F., 201, Edge Lane, Liverpool.
Bilson, F. E., 1, Lansdowne Crescent, Bournemouth.
Bird, F. C. J., Devon Wharf, Emmott Street, Mile End, E.
Bishop, J. H., The Broadway, Tunbridge Wells.
Black, W. J., 17, Main St., Tweedmouth, Berwick-on-Tweed.
Blackburn, A. E. H., c/o Messrs. Mottershead & Co., 7, Exchange Street, Manchester.
Blain, A. L., 69, Market Street, Manchester.
Blain, William Rushton, 25, Market Street, Bolton.
Blair, Richard, 7, Patrick Street, Cork.
Blake, R. F., F.I.C., F.C.S., 128, Scottish Provident Buildings, Belfast.
Blakely, P. L., 11, Cross Street, Ryde, Isle of Wight.
Blaker, E. J., East Liss, Hants.
Blenkiron, J., 115, Princes Street, Edinburgh.
Blore, Moulton, 26, Oldham Road, Manchester.
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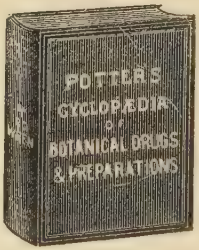

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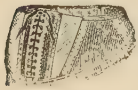

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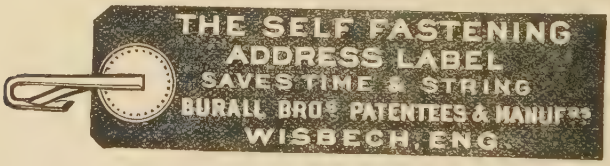

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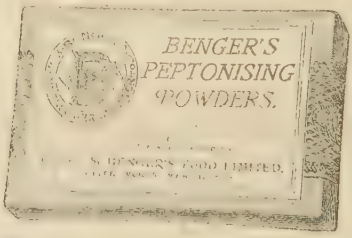

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